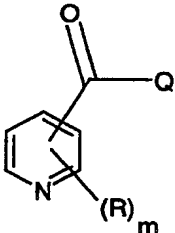




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(21) International Application Number: PCT/EP99/06761 (22) International Filing Date: 13 September 1999 (13.09.99) (30) Priority Data: 1873/98 15 September 1998 (15.09.98) CH (71) Applicant (for all designated States except AT US): NOVARTIS AG [CH/CH]; Schwarzwaldallee 215, CH-4058 Basel (CH). (71) Applicant (for AT only): NOVARTIS-ERFINDUNGEN VERWALTUNGSGESELLSCHAFT MBH [AT/AT]; Brunner Strasse 59, A-1230 Vienna (AT). (72) Inventors; and (75) Inventors/Applicants (for US only): EDMUNDS, Andrew [GB/CH]; Hegenheimerstrasse 66, CH-4055 Basel (CH). SECKINGER, Karl [DE/DE]; Bergstrasse 19, D-79359 Riegel (DE). LÜTHY, Christoph [CH/CH]; Mittelweg 1, CH-4142 Münchenstein (CH). KUNZ, Walter [CH/CH]; Buchenstrasse 9, CH-4104 Oberwil (CH). DE MESMAEKER, Alain [BE/CH]; Ueligasse 31, CH-4447 Kaerkinden (CH). SCHAETZER, Jürgen [DE/DE]; Holbeinstrasse 1, D-79618 Rheinfelden (DE).		(74) Agent: BECKER, Konrad; Novartis AG, Corporate Intellectual Property, Patent & Trademark Dept., CH-4002 Basel (CH). (81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: PYRIDINE KETONES USEFUL AS HERBICIDES <div style="text-align: center; margin: 20px 0;">  <div style="position: absolute; left: 610px; top: 585px;">(I)</div> </div> (57) Abstract <p>Compounds of formula (I) in which the substituents are as defined in claim 1 are suitable for use as herbicides.</p>		

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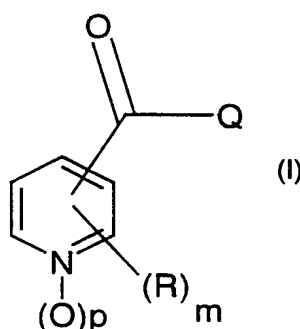
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PYRIDINE KETONES USEFUL AS HERBICIDES

The present invention relates to novel herbicidally active pyridine ketones, to processes for their preparation, to compositions which comprise these compounds, and to their use for controlling weeds, in particular in crops of useful plants, or for inhibiting plant growth.

Pyridine ketones having herbicidal action are described, for example, in WO 97/46530. We have now found novel pyridine ketones having herbicidal and growth-inhibiting properties.

The present invention thus provides compounds of the formula I



in which

each R independently is C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₂-C₆haloalkynyl, C₃-C₆cycloalkyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkylthio, C₁-C₆alkylsulfanyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkylthio, C₁-C₆haloalkylsulfanyl, C₁-C₆haloalkylsulfonyl, C₁-C₆alkoxycarbonyl, C₁-C₆alkylcarbonyl, C₁-C₆alkylamino, di-C₁-C₆alkylamino, C₁-C₆alkylaminosulfonyl, di-C₁-C₆alkylaminosulfonyl, -N(R₁)-S-R₂, -N(R₃)-SO-R₄, -N(R₅)-SO₂-R₆, nitro, cyano, halogen, hydroxyl, amino, formyl, hydroxy-C₁-C₆alkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₁-C₆alkoxycarbonyloxy-C₁-C₆alkyl, C₁-C₆alkylthio-C₁-C₆alkyl, C₁-C₆alkylsulfanyl-C₁-C₆alkyl, C₁-C₆alkylsulfonyl-C₁-C₆alkyl, thiocyanato-C₁-C₆alkyl, cyano-C₁-C₆alkyl, oxiranyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, C₁-C₆alkoxy-C₁-C₆alkoxy, cyano-C₁-C₆alkenyloxy, C₁-C₆alkoxycarbonyloxy-C₁-C₆alkoxy, C₃-C₆alkynyloxy, cyano-C₁-C₆alkoxy, C₁-C₆alkoxycarbonyl-C₁-C₆alkoxy, C₁-C₆alkylthio-C₁-C₆alkoxy, alkoxycarbonyl-C₁-C₆alkylthio, alkoxycarbonyl-C₁-C₆alkylsulfanyl, alkoxycarbonyl-C₁-C₆alkylsulfonyl, C₁-C₆alkylsulfonyloxy, C₁-C₆haloalkylsulfonyloxy, phenyl, benzyl, phenoxy, phenylthio, phenylsulfanyl, phenylsulfonyl, benzylthio, benzylsulfanyl or benzylsulfonyl, where the phenyl groups may

- 2 -

be mono- or polysubstituted by halogen, methyl, ethyl, trifluoromethyl, methoxy or nitro, or R is a five- to ten-membered monocyclic or fused bicyclic ring system, which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where the ring system is either attached directly to the pyridine ring or attached to the pyridine ring via a C₁-C₄alkylene group, and where each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and where the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₇, NR₈R₉, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

m is 1, 2, 3 or 4;

p is 0 or 1;

R₁, R₃ and R₅ independently of one another are hydrogen or C₁-C₆alkyl;

R₂ is NR₁₀R₁₁, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₄ is NR₁₂R₁₃, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₆ is NR₁₄R₁₅, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

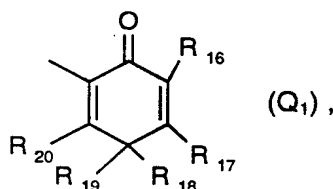
- 3 -

R₇ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₈, R₁₀, R₁₂ and R₁₄ independently of one another are hydrogen or C₁-C₆alkyl;

R₉, R₁₁, R₁₃ and R₁₅ independently of one another are C₁-C₆alkyl or C₁-C₆alkoxy;

Q is the group Q₁



in which

R₁₆, R₁₇, R₁₈ and R₁₉ independently of one another are hydrogen, hydroxyl, C₁-C₄alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₄alkoxycarbonyl, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-NHS(O)₂, C₁-C₄haloalkyl, -NH-C₁-C₄alkyl, -N(C₁-C₄alkyl)₂, C₁-C₆alkoxy, cyano, nitro, halogen or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano; or two adjacent substituents from the group consisting of R₁₆, R₁₇, R₁₈ and R₁₉ form a C₂-C₆alkylene bridge;

R₂₀ is hydroxyl, O⁻M⁺, halogen, cyano, SCN, OCN, C₁-C₁₂alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₄alkoxy, C₁-C₁₂alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₆alkoxy-C₁-C₆alkylthio, C₁-C₆alkoxy-C₁-C₆alkylsulfinyl, C₁-C₆alkoxy-C₁-C₆alkylsulfonyl, C₂-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂alkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₂-C₁₂haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylthio, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfonyl, (C₁-C₄alkoxy)₂P(O)O, C₁-C₄alkyl-(C₁-C₄alkoxy)P(Φ)O, H(C₁-C₄alkoxy)P(O)O,

R₃₇-R₃₈N, R₇₁-R₇₂NNH-, R₂₁-R₂₂NC(O)O-, R₇₃-R₇₄NC(O)NH-, C₁-C₄alkyl-S(O)₂NR₃₉, C₁-C₄haloalkyl-S(O)₂NR₄₀, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C₁-C₆alkoxy, C₁-C₆alkylthio or cyano,

- 4 -

C₂-C₁₈alkenylcarbonyloxy, C₂-C₁₈alkynylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂alkoxycarbonyloxy, C₁-C₁₂alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbamoyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano, or a group Ar₁-thio, Ar₂-sulfinyl, Ar₃-sulfonyl, -OCO-Ar₄ or NH-Ar₅ in which Ar₁, Ar₂, Ar₃, Ar₄ and Ar₅ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₄₁, NR₄₂R₄₃, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₄₁ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₄₂ is hydrogen or C₁-C₆alkyl;

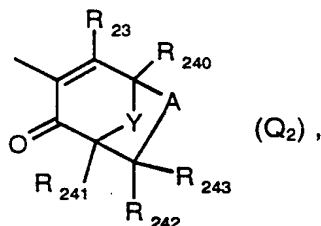
R₄₃ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₂₁, R₃₇, R₃₉, R₄₀, R₇₁ and R₇₃ independently of one another are hydrogen or C₁-C₄alkyl;

R₂₂, R₃₈, R₇₂ and R₇₄ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₂₁ and R₂₂ together or R₃₇ and R₃₈

- 5 -

together or R_{71} and R_{72} together or R_{73} and R_{74} together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups; or are the group Q_2



in which

Y is a chemical bond, an alkylene group A_1 , carbonyl, oxygen, sulfur, sulfinyl, sulfonyl, $-NHR_{248}$ or $NH(CO)R_{249}$;

A_1 is $C(R_{246}R_{247})m_{01}$;

A is $C(R_{244}R_{245})r$;

r and m_{01} independently of one another are 0, 1 or 2;

R_{240} is hydrogen, methyl or C_1 - C_3 alkoxycarbonyl;

R_{241} , R_{242} , R_{243} , R_{244} , R_{245} , R_{246} and R_{247} independently of one another are hydrogen, halogen or methyl, or R_{243} together with an adjacent group R_{245} or R_{247} is a chemical bond;

R_{248} and R_{249} independently of one another are hydrogen or C_1 - C_4 alkyl;

R_{23} is hydroxyl, O^+M^+ , halogen, cyano, SCN, OCN, C_1 - C_{12} alkoxy, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkoxy, C_1 - C_{12} alkylthio, C_1 - C_{12} alkylsulfinyl, C_1 - C_{12} alkylsulfonyl, C_1 - C_{12} haloalkylthio, C_1 - C_{12} haloalkylsulfinyl, C_1 - C_{12} haloalkylsulfonyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylthio, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfonyl, C_2 - C_{12} alkenylthio, C_2 - C_{12} alkenylsulfinyl, C_2 - C_{12} alkenylsulfonyl, C_2 - C_{12} alkynylthio, C_2 - C_{12} alkynylsulfinyl, C_2 - C_{12} alkynylsulfonyl, C_2 - C_{12} haloalkenylthio, C_2 - C_{12} haloalkenylsulfinyl, C_2 - C_{12} haloalkenylsulfonyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylthio, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfinyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfonyl, $(C_1$ - C_4 alkoxy) $_2P(O)O$, C_1 - C_4 alkyl- $(C_1$ - C_4 alkoxy) $P(O)O$, $H(C_1$ - C_4 alkoxy) $P(O)O$,

$R_{44}R_{45}N$, $R_{75}R_{76}NNH-$, $R_{46}R_{47}NC(O)O-$, $R_{77}R_{78}NC(O)NH-$, C_1 - C_4 alkyl- $S(O)_2NR_{48}$, C_1 - C_4 haloalkyl- $S(O)_2NR_{49}$, C_1 - C_4 alkyl- $S(O)_2O$, C_1 - C_4 haloalkyl- $S(O)_2O$, C_1 - C_{18} alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C_1 - C_6 alkoxy, C_1 - C_6 alkylthio or cyano, C_2 - C_{18} alkenylcarbonyloxy, C_2 - C_{18} alkynylcarbonyloxy, C_3 - C_6 cycloalkylcarbonyloxy, C_1 - C_{12} alkoxycarbonyloxy, C_1 - C_{12} alkylthiocarbonyloxy, C_1 - C_{12} alkylthiocarbonyl, C_1 - C_6 alkyl- $NH(CS)N(C_1$ - C_6 alkyl)- $NH-$, di- C_1 - C_6 alkyl- $N(CS)N(C_1$ - C_6 alkyl)- $NH-$, benzyloxy, benzylthio,

- 6 -

benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano,

or a group Ar₆-thio, Ar₇-sulfinyl, Ar₈-sulfonyl, -OCO-Ar₉ or NH-Ar₁₀ in which Ar₆, Ar₇, Ar₈, Ar₉ and Ar₁₀ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₅₀, NR₅₁R₅₂, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₅₀ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₅₁ is hydrogen or C₁-C₆alkyl;

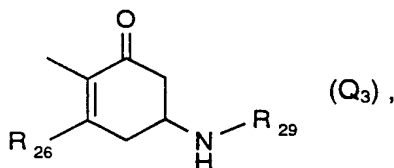
R₅₂ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₄₆, R₄₄, R₄₈, R₄₉, R₇₅ and R₇₇ independently of one another are hydrogen or C₁-C₄alkyl;

R₄₇, R₄₅, R₇₆ and R₇₈ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₄₄ and R₄₅ together or R₄₆ and R₄₇ together or R₇₅ and R₇₆ together or R₇₇ and R₇₈ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups;

or are the group Q₃

- 7 -



in which

R₂₆ is hydroxyl, O⁻M⁺, halogen, cyano, SCN, OCN, C₁-C₁₂ alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₄ alkoxy, C₁-C₁₂alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂ haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₆alkoxy-C₁-C₆alkylthio, C₁-C₆alkoxy-C₁-C₆ alkylsulfinyl, C₁-C₆alkoxy-C₁-C₆alkylsulfonyl, C₂-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂ alkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₂-C₁₂ haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylthio, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfonyl, (C₁-C₄alkoxy)₂P(O)O, C₁-C₄alkyl-(C₁-C₄alkoxy)P(O)O, H(C₁-C₄alkoxy)P(O)O,

R₅₃R₅₄N, R₇₉R₈₀NNH-, R₅₅R₅₆NC(O)O-, R₈₁R₈₂NC(O)NH-, C₁-C₄alkyl-S(O)₂NR₅₇, C₁-C₄ haloalkyl-S(O)₂NR₅₈, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C₁-C₆alkoxy, C₁-C₆alkylthio or cyano, C₂-C₁₈alkenylcarbonyloxy, C₂-C₁₈alkynylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂ alkoxycarbonyloxy, C₁-C₁₂alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbonyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄ haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄ alkyl), halogen, nitro or cyano,

or a group Ar₁₁-thio, Ar₁₂-sulfinyl, Ar₁₃-sulfonyl, -OCO-Ar₁₄ or NH-Ar₁₅ in which Ar₁₁, Ar₁₂, Ar₁₃, Ar₁₄ and Ar₁₅ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in

- 8 -

which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₅₉, NR₆₀R₆₁, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₅₉ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₆₀ is hydrogen or C₁-C₆alkyl;

R₆₁ is C₁-C₆alkyl or C₁-C₆alkoxy;

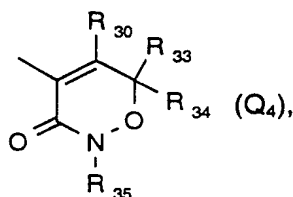
R₅₅, R₅₃, R₅₇, R₅₈, R₇₉ and R₈₁ independently of one another are hydrogen or C₁-C₄alkyl;

R₅₆, R₅₄, R₈₀ and R₈₂ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₅₃ and R₅₄ together or R₅₅ and R₅₆ together or R₇₉ and R₈₀ together or R₈₁ and R₈₂ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups;

R₂₉ is hydrogen, C₁-C₆alkyl, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, (C₁-C₄alkyl)NHCO, phenylaminocarbonyl, benzylaminocarbonyl or (C₁-C₄alkyl)₂NCO, where the phenyl and benzyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano;

or is the group Q₄

- 9 -



in which

R_{30} is hydroxyl, O^+M^+ , halogen, cyano, SCN, OCN, C_1 - C_{12} alkoxy, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkoxy, C_1 - C_{12} alkylthio, C_1 - C_{12} alkylsulfinyl, C_1 - C_{12} alkylsulfonyl, C_1 - C_{12} haloalkylthio, C_1 - C_{12} haloalkylsulfinyl, C_1 - C_{12} haloalkylsulfonyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylthio, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfonyl, C_2 - C_{12} alkenylthio, C_2 - C_{12} alkenylsulfinyl, C_2 - C_{12} alkenylsulfonyl, C_2 - C_{12} alkynylthio, C_2 - C_{12} alkynylsulfinyl, C_2 - C_{12} alkynylsulfonyl, C_2 - C_{12} haloalkenylthio, C_2 - C_{12} haloalkenylsulfinyl, C_2 - C_{12} haloalkenylsulfonyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylthio, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfinyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfonyl, $(C_1$ - C_4 alkoxy) $_2$ P(O)O, C_1 - C_4 alkyl- $(C_1$ - C_4 alkoxy)P(O)O, $H(C_1$ - C_4 alkoxy)P(O)O,

$R_{62}R_{63}N$, $R_{83}R_{84}NNH-$, $R_{64}R_{65}NC(O)O-$, $R_{85}R_{86}NC(O)NH-$, C_1 - C_4 alkyl-S(O) $_2$ NR $_{66}$, C_1 - C_4 haloalkyl-S(O) $_2$ NR $_{67}$, C_1 - C_4 alkyl-S(O) $_2$ O, C_1 - C_4 haloalkyl-S(O) $_2$ O, C_1 - C_{18} alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C_1 - C_6 alkoxy, C_1 - C_6 alkylthio or cyano, C_2 - C_{18} alkenylcarbonyloxy, C_2 - C_{18} alkynylcarbonyloxy, C_3 - C_6 cycloalkylcarbonyloxy, C_1 - C_{12} alkoxycarbonyloxy, C_1 - C_{12} alkylthiocarbonyloxy, C_1 - C_{12} alkylthiocarbonyl, C_1 - C_6 alkyl-NH(CS)N(C_1 - C_6 alkyl)-NH-, di- C_1 - C_6 alkyl-N(CS)N(C_1 - C_6 alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, C_1 - C_4 alkoxy, C_1 - C_4 haloalkoxy, C_1 - C_4 alkylcarbonyl, C_1 - C_4 alkoxycarbonyl, C_1 - C_4 alkylamino, di- C_1 - C_4 alkylamino, C_1 - C_4 alkylthio, C_1 - C_4 alkylsulfinyl, C_1 - C_4 alkylsulfonyl, C_1 - C_4 alkyl-S(O) $_2$ O, C_1 - C_4 haloalkylthio, C_1 - C_4 haloalkylsulfinyl, C_1 - C_4 haloalkylsulfonyl, C_1 - C_4 haloalkyl-S(O) $_2$ O, C_1 - C_4 alkyl-S(O) $_2$ NH, C_1 - C_4 alkyl-S(O) $_2$ N(C_1 - C_4 alkyl), halogen, nitro or cyano,

or a group Ar $_{16}$ -thio, Ar $_{17}$ -sulfinyl, Ar $_{18}$ -sulfonyl, -OCO-Ar $_{19}$ or NH-Ar $_{20}$ in which Ar $_{16}$, Ar $_{17}$, Ar $_{18}$, Ar $_{19}$ and Ar $_{20}$ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in

- 10 -

which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₆₈, NR₆₉R₇₀, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₆₈ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₇₀ is hydrogen or C₁-C₆alkyl;

R₆₁ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₆₄, R₆₂, R₆₆, R₆₇, R₈₃ and R₈₅ independently of one another are hydrogen or C₁-C₄alkyl;

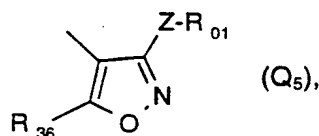
R₆₅, R₆₃, R₈₄ and R₈₆ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₆₂ and R₆₃ together or R₆₄ and R₆₅ together or R₈₃ and R₈₄ together or R₈₅ and R₈₆ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups;

R₃₃ and R₃₄ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₄alkoxycarbonyl, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-NHS(O)₂, C₁-C₄haloalkyl, -NH-C₁-C₄alkyl, -N(C₁-C₄alkyl)₂, C₁-C₆alkoxy or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano; or R₃₃ and R₃₄ together form a C₂-C₆alkylene bridge; and

R₃₅ is hydrogen, C₁-C₆alkyl, C₃-C₆alkenyl, C₃-C₆alkynyl or benzyl, which for its part may be substituted by halogen, methyl or methoxy, or is C₁-C₄alkoxycarbonyl or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄

- 11 -

alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano;
or is the group Q₅



in which

Z is S, SO or SO₂;

R₀₁ is hydrogen, C₁-C₈alkyl, C₁-C₈alkyl substituted by halogen, C₁-C₄alkoxy, C₁-C₄alkylthio, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, -CO₂R₀₂, -COR₀₃, -COSR₀₄, -NR₀₅R₀₆, CONR₀₃₆R₀₃₇ or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₂₅R₂₆, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₁₅CO₂R₀₂₇;
or R₀₁ is C₂-C₈alkenyl or C₂-C₈alkenyl substituted by halogen, C₁-C₄alkoxy, C₁-C₄alkylthio, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, -CONR₀₃₂R₀₃₃, cyano, nitro, -CHO, -CO₂R₀₃₈, -COR₀₃₉, -COS-C₁-C₄alkyl, -NR₀₃₄R₀₃₅ or phenyl which for its part may be substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄

- 12 -

alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₄₀R₀₄₁, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₄₃CO₂R₀₄₂; or R₀₁ is C₃-C₆alkynyl or C₃-C₆alkynyl substituted by halogen, C₁-C₄haloalkyl, cyano, -CO₂R₀₄₄ or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₂₈R₀₂₉, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₃₁CO₂R₀₃₀; or R₀₁ is C₃-C₇cycloalkyl, C₃-C₇cycloalkyl substituted by C₁-C₄alkyl, C₁-C₄alkoxy, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl or phenyl, which for its part may be substituted by halogen, nitro, cyano, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylthio, C₁-C₄haloalkylthio, C₁-C₄alkyl and C₁-C₄haloalkyl; or R₀₁ is C₁-C₄alkylene-C₃-C₇cycloalkyl, phenyl, or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₄₅R₀₄₆, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, or -NR₀₄₈CO₂R₀₄₇; or R₀₁ is C₁-C₄alkylene-phenyl, COR₀₇ or 4-6-membered heterocyclyl; R₀₂, R₀₃₈, R₀₄₄ and R₀₆₆ independently of one another are hydrogen, C₁-C₄alkyl, phenyl, or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-

C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfanyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₄₉R₀₅₀, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfanyl, C₁-C₄haloalkylsulfanyl, phenylsulfanyl, C₁-C₄alkylene-phenyl or -NR₀₅₂CO₂R₀₅₃;

R₀₃, R₀₃₉ and R₀₆₇ independently of one another are C₁-C₄alkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfanyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₇₀R₀₅₄, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfanyl, C₁-C₄haloalkylsulfanyl, phenylsulfanyl, C₁-C₄alkylene-phenyl or -NR₀₅₆CO₂R₀₅₅;

R₀₄ is C₁-C₄alkyl;

R₀₅ is hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfanyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂H, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂H, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₅₇R₀₅₈, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl,

- 14 -

phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₆₀CO₂R₀₅₉;

R₀₆ is hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₆₁R₀₆₂, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₆₄CO₂R₀₆₃;

R₀₇ is phenyl, substituted phenyl, C₁-C₄alkyl, C₁-C₄alkoxy or -NR₀₈R₀₉;

R₀₈ and R₀₉ independently of one another are C₁-C₄alkyl, phenyl or phenyl which is substituted by halogen, nitro, cyano, C₁-C₄alkyl, C₁-C₄alkoxy, C₁-C₄thioalkyl, -CO₂R₀₆₆, -COR₀₆₇, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkyl; or R₀₈ and R₀₉ together form a 5-6-membered ring which may be interrupted by oxygen, NR₀₆₅ or S,

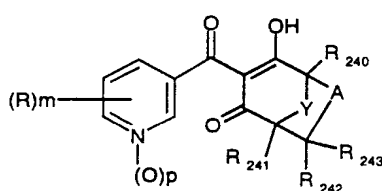
R₀₁₅, R₀₃₁, R₀₄₃, R₀₄₈, R₀₅₂, R₀₅₆, R₀₆₀ and R₀₆₄ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl or C₃-C₇cycloalkyl;

R₀₂₅, R₀₂₆, R₀₂₇, R₀₂₈, R₀₂₉, R₀₃₀, R₀₃₂, R₀₃₃, R₀₃₄, R₀₃₅, R₀₃₆, R₀₃₇, R₀₄₀, R₀₄₁, R₀₄₂, R₀₄₅, R₀₄₆, R₀₄₇, R₀₄₉, R₀₅₀, R₀₅₃, R₀₅₄, R₀₅₅, R₀₅₇, R₀₅₈, R₀₅₉, R₀₆₁, R₀₆₂, R₀₆₃, R₀₆₅ and R₀₇₀ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl, or phenyl which is substituted by halogen, nitro, cyano, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylthio, C₁-C₄haloalkylthio, C₁-C₄alkyl or C₁-C₄haloalkyl; and

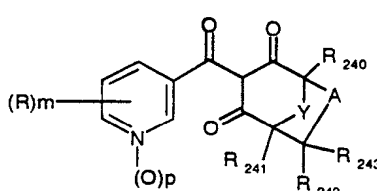
R₃₆ is C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or C₃-C₆cycloalkyl which is substituted by halogen, C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄alkylcarbonyl, di-C₁-C₄alkylamino, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O or phenyl which for its part may be substituted by halogen, C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆alkynyl,

cyano, nitro or COOH; and agronomically acceptable salts M^+ and all stereoisomers and tautomers of the compounds of the formula I.

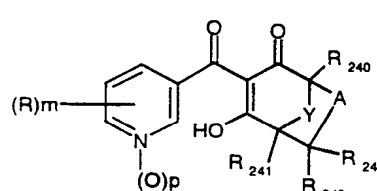
The compounds of the formula I can be present in different isomeric forms which can be isolated in pure form. The invention therefore also embraces all stereoisomeric forms of the compound of the formula I. Examples of these isomeric forms are the formulae Ix, Ixx, Ixxx and Ixxxx below, in which Q is the group Q_2 .



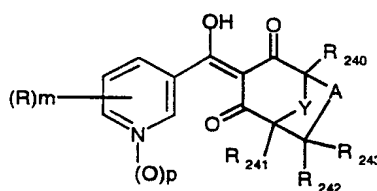
Ix



Ixx



Ixxx



Ixxxx

The alkyl groups occurring in the definitions of the substituents can be straight-chain or branched and are, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, pentyl, hexyl, heptyl and octyl and their branched isomers. Alkoxy, alkenyl and alkynyl radicals are derived from the alkyl radicals mentioned. The alkenyl and alkynyl groups can be mono- or polyunsaturated.

Halogen is generally fluorine, chlorine, bromine or iodine. This also applies, correspondingly, to halogen in combination with other meanings, such as haloalkyl or halophenyl.

Haloalkyl groups preferably have a chain length of from 1 to 8 carbon atoms. Haloalkyl is, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, 1,1-difluoro-2,2,2-trichloroethyl, 2,2,3,3-tetrafluoroethyl and 2,2,2-trichloroethyl; preferably

trichloromethyl, difluorochloromethyl, difluoromethyl, trifluoromethyl and dichlorofluoromethyl.

Suitable haloalkenyl groups are alkenyl groups which are mono- or polysubstituted by halogen, halogen being fluorine, chlorine, bromine and iodine and in particular fluorine and chlorine, for example 2,2-difluoro-1-methylvinyl, 3-fluoropropenyl, 3-chloropropenyl, 3-bromopropenyl, 2,3,3-trifluoropropenyl, 2,3,3-trichloropropenyl and 4,4,4-trifluorobut-2-en-1-yl. Among the C₃-C₂₀alkenyl groups which are mono-, di- or trisubstituted by halogen, preference is given to those having a chain length of from 3 to 5 carbon atoms.

Suitable haloalkynyl groups are, for example, alkynyl groups which are mono- or polysubstituted by halogen, halogen being bromine, iodine and in particular fluorine and chlorine, for example 3-fluoropropynyl, 3-chloropropynyl, 3-bromopropynyl, 3,3,3-trifluoropropynyl and 4,4,4-trifluorobut-2-yn-1-yl. Among the alkynyl groups which are mono- or polysubstituted by halogen, preference is given to those having a chain length of from 3 to 5 carbon atoms.

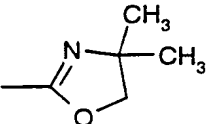
Alkoxy groups preferably have a chain length of from 1 to 6 carbon atoms. Alkoxy is, for example, methoxy, ethoxy, propoxy, i-propoxy, n-butoxy, isobutoxy, sec-butoxy and tert-butoxy and also the isomeric pentyloxy and hexyloxy radicals; preferably methoxy and ethoxy. Alkylcarbonyl is preferably acetyl or propionyl. Alkoxycarbonyl is, for example, methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxycarbonyl, n-butoxycarbonyl, isobutoxycarbonyl, sec-butoxycarbonyl or tert-butoxycarbonyl; preferably methoxycarbonyl or ethoxycarbonyl. Haloalkoxy groups preferably have a chain length of from 1 to 8 carbon atoms. Haloalkoxy is, for example, fluoromethoxy, difluoromethoxy, trifluoromethoxy, 2,2,2-trifluoroethoxy, 1,1,2,2-tetrafluoroethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2,2-difluoroethoxy and 2,2,2-trichloroethoxy; preferably difluoromethoxy, 2-chloroethoxy and trifluoromethoxy. Alkylthio groups preferably have a chain length of from 1 to 8 carbon atoms. Alkylthio is, for example, methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, sec-butylthio or tert-butylthio, preferably methylthio and ethylthio. Alkylsulfinyl is, for example, methylsulfinyl, ethylsulfinyl, propylsulfinyl, isopropylsulfinyl, n-butylsulfinyl, isobutylsulfinyl, sec-butylsulfinyl, tert-butylsulfinyl; preferably methylsulfinyl and ethylsulfinyl.

- 17 -

Alkylsulfonyl is, for example, methylsulfonyl, ethylsulfonyl, propylsulfonyl, isopropylsulfonyl, n-butylsulfonyl, isobutylsulfonyl, sec-butylsulfonyl or tert-butylsulfonyl; preferably methylsulfonyl or ethylsulfonyl. Alkoxyalkoxy groups preferably have a chain length of from 1 to 8 carbon atoms. Examples of alkoxyalkoxy groups are: methoxymethoxy, methoxyethoxy, methoxypropoxy, ethoxymethoxy, ethoxyethoxy, propoxymethoxy or butoxybutoxy. Alkylamino is, for example, methylamino, ethylamino, n-propylamino, isopropylamino or the isomeric butylamines. Dialkylamino is, for example, dimethylamino, methylethylamino, diethylamino, n-propylmethylamino, dibutylamino and diisopropylamino. Preference is given to alkylamino groups having a chain length of from 1 to 4 carbon atoms. Alkoxyalkyl groups have a chain length of preferably from 1 to 6 carbon atoms. Alkoxyalkyl is, for example, methoxymethyl, methoxyethyl, ethoxymethyl, ethoxyethyl, n-propoxymethyl, n-propoxyethyl, isopropoxymethyl or isopropoxyethyl. Alkylthioalkyl groups preferably have from 1 to 8 carbon atoms. Alkylthioalkyl is, for example, methylthiomethyl, methylthioethyl, ethylthiomethyl, ethylthioethyl, n-propylthiomethyl, n-propylthioethyl, isopropylthiomethyl, iso-propylthioethyl, butylthiomethyl, butylthioethyl or butylthiobutyl. The cycloalkyl groups preferably have from 3 to 8 ring carbon atoms, for example cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl and cyclooctyl. Phenyl, also as part of a substituent as phenoxy, benzyl, benzyloxy, benzoyl, phenylthio, phenylalkyl, phenoxyalkyl, may be substituted. In this case, the substituents can be in ortho, meta and/or para position. The preferred substituent positions are the ortho and para positions to the ring attachment point. Heterocyclyl is to be understood as meaning ring systems which, in addition to carbon atoms, contain at least one heteroatom, such as nitrogen, oxygen and/or sulfur. They can be saturated or unsaturated. In the context of the present invention, heterocyclyl ring systems may also be substituted. Suitable substituents are, for example, C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, cyano, nitro, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄alkylthio or C₃-C₆cycloalkyl.

Heterocyclyl may be, for example, furyl, thiophenyl, pyrrolidyl, piperidiny, morpholinyl, pyridyl, imidazolyl, tetrahydrofuryl, tetrahydropyranyl, dihydrofuryl, dihydropyranyl, isoxazolyl, oxazolyl, isothiazolyl, 1,2,3-thiadiazolyl, 1,2,4-thiadiazolyl, thiazolyl, pyrazolyl, 1,2,4-triazolyl, 1,2,3-triazolyl, tetrazolyl, pyrimidyl, pyrazinyl, sym. or unsym. triazinyl,

- 18 -

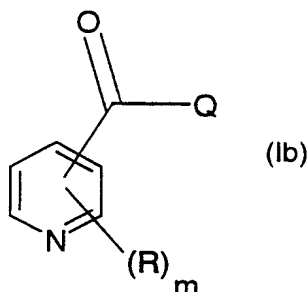
piperazinyl, oxazoliny (for example: ) , oxazolidiny, imidazoliny,

imidazolidiny, dioxanyl, oxetanyl, in particular 2-oxetanyl, or phthalimidyl.

The invention also embraces the salts M^+ which can be formed by the compounds of the formula I, in particular the compounds of the formula I in which R_{20} , R_{23} , R_{26} and R_{30} are hydroxyl, preferably with amines, alkali metal and alkaline earth metal bases or quaternary ammonium bases. Among the alkali metal and alkaline earth metal bases, the hydroxides of lithium, sodium, potassium, magnesium or calcium, in particular those of sodium or potassium, may be especially emphasized as salt formers. Examples of amines suitable for ammonium salt formation are both ammonia and primary, secondary and tertiary C_1 - C_{18} alkylamines, C_1 - C_4 hydroxyalkylamines and C_2 - C_4 alkoxyalkylamines, for example methylamine, ethylamine, n-propylamine, isopropylamine, the four isomeric butylamines, n-amylamine, isoamylamine, hexylamine, heptylamine, octylamine, nonylamine, decylamine, pentadecylamine, hexadecylamine, heptadecylamine, octadecylamine, methylethylamine, methylisopropylamine, methylhexylamine, methylnonylamine, methylpentadecylamine, methyloctadecylamine, ethylbutylamine, ethylheptylamine, ethyloctylamine, hexylheptylamine, hexyloctylamine, dimethylamine, diethylamine, di-n-propylamine, diisopropylamine, di-n-butylamine, di-n-amylamine, diisoamylamine, dihexylamine, diheptylamine, dioctylamine, ethanolamine, n-propanolamine, isopropanolamine, N,N-diethanolamine, N-ethylpropanolamine, N-butylethanolamine, allylamine, n-butenyl-2-amine, n-pentenyl-2-amine, 2,3-dimethylbutenyl-2-amine, dibutenyl-2-amine, n-hexenyl-2-amine, propylenediamine, trimethylamine, triethylamine, tri-n-propylamine, triisopropylamine, tri-n-butylamine, triisobutylamine, tri-sec-butylamine, tri-n-amylamine, methoxyethylamine and ethoxyethylamine; heterocyclic amines, for example pyridine, quinoline, isoquinoline, morpholine, piperidine, pyrrolidine, indoline, quinuclidine and azepine; primary arylamines, for example anilines, methoxyanilines, ethoxyanilines, o,m,p-toluidines, phenylenediamines, naphthylamines and o,m,p-chloroanilines; but in particular triethylamine, isopropylamine and diisopropylamine. Quaternary ammonium bases which are suitable for salt formation are, for example, $[N(R_{a01} R_{b01} R_{c01} R_{d01})]^+ OH^-$, where R_{a01} , R_{b01} , R_{c01} and R_{d01} independently of one another are C_1 - C_4 alkyl. Further suitable tetraalkylammonium bases with other anions can be obtained, for example, by anion exchange reactions.

- 19 -

Preferred compounds of the formula I correspond to the formula Ib

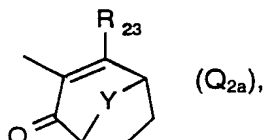


in which

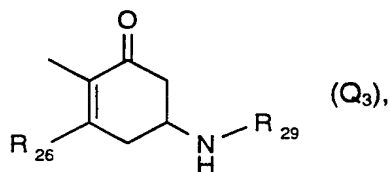
each R independently is C₁-C₆alkyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkylthio, C₁-C₆-alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkylthio, C₁-C₆haloalkylsulfinyl, C₁-C₆haloalkylsulfonyl, C₁-C₆alkoxycarbonyl, C₁-C₆alkylcarbonyl, C₁-C₆alkylamino, di-C₁-C₆-alkylamino, C₁-C₆alkylaminosulfonyl, di-C₁-C₆alkylaminosulfonyl, -N(R₁)-S-R₂, -N(R₃)-SO-R₄, -N(R₅)-SO₂-R₆, nitro, cyano, halogen, hydroxyl, amino, or a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where the ring system is either attached directly to the pyridine ring or attached via a C₁-C₄alkylene group to the pyridine ring, and each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄-cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃-alkylene-R₇, NR₈R₉, halogen, cyano, nitro, phenyl and benzylthio where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen; Q is the group Q₁ in which

- 20 -

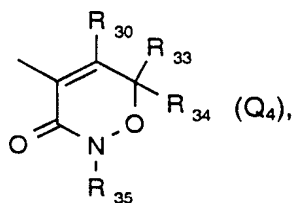
R_{20} is hydroxyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylcarbonyloxy, C_1 - C_4 alkoxycarbonyloxy, $R_{21}R_{22}N$ - $C(O)O$, phenylthio, C_1 - C_4 alkylthio, C_1 - C_4 alkyl- $S(O)_2O$, $(C_1$ - C_4 alkoxy) $_2P(O)O$, C_1 - C_4 alkyl(C_1 - C_4 alkoxy) $P(O)O$, $H(C_1$ - C_4 alkoxy) $P(O)O$ or benzoyloxy; and
 R_{21} and R_{22} independently of one another are hydrogen or C_1 - C_4 alkyl;
 or the group Q_{2a}



in which R_{23} is hydroxyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylcarbonyloxy, C_1 - C_4 alkoxycarbonyloxy, $R_{24}R_{25}N$ - $C(O)O$, phenylthio, C_1 - C_4 alkylthio, C_1 - C_4 alkyl- $S(O)_2O$, $(C_1$ - C_4 alkoxy) $_2P(O)O$, C_1 - C_4 -alkyl(C_1 - C_4 alkoxy) $P(O)O$, $H(C_1$ - C_4 alkoxy) $P(O)O$ or benzoyloxy; and
 R_{24} and R_{25} independently of one another are hydrogen or C_1 - C_4 alkyl; and
 Y is oxygen, sulfur, a chemical bond or a C_1 - C_4 alkylene bridge;
 or the group Q_3



in which R_{26} is hydroxyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylcarbonyloxy, C_1 - C_4 alkoxycarbonyloxy, $R_{27}R_{28}N$ - $C(O)O$, phenylthio, C_1 - C_4 alkylthio, C_1 - C_4 alkyl- $S(O)_2O$, $(C_1$ - C_4 alkoxy) $_2P(O)O$, C_1 - C_4 -alkyl(C_1 - C_4 alkoxy) $P(O)O$, $H(C_1$ - C_4 alkoxy) $P(O)O$ or benzoyloxy; and
 R_{27} and R_{28} independently of one another are hydrogen or C_1 - C_4 alkyl and
 R_{29} is hydrogen, C_1 - C_6 alkyl, C_1 - C_4 alkylcarbonyl, C_1 - C_4 alkoxycarbonyl, $(C_1$ - C_4 alkyl) $NHCO$ or $(C_1$ - C_4 alkyl) $_2NCO$; or the group Q_4



- 21 -

in which R_{30} is hydroxyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylcarbonyloxy, C_1 - C_4 alkoxycarbonyloxy, $R_{31}R_{32}N-C(O)O$, phenylthio, C_1 - C_4 alkylthio, C_1 - C_4 alkyl- $S(O)_2O$, $(C_1$ - C_4 alkoxy) $_2P(O)O$, C_1 - C_4 -alkyl(C_1 - C_4 alkoxy) $P(O)O$, $H(C_1$ - C_4 alkoxy) $P(O)O$ or benzoyloxy; and R_{31} and R_{32} independently of one another are hydrogen or C_1 - C_4 alkyl; R_{33} and R_{34} independently of one another are hydrogen, C_1 - C_4 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_1 - C_4 -alkoxycarbonyl, C_1 - C_6 alkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkylsulfonyl, C_1 - C_4 alkyl-NHS(O) $_2$, C_1 - C_4 haloalkyl, -NH- C_1 - C_4 alkyl, -N(C_1 - C_4 alkyl) $_2$, C_1 - C_6 alkoxy, or phenyl which for its part may be substituted by C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, C_1 - C_4 alkoxy, C_1 - C_4 haloalkoxy, C_1 - C_4 alkylcarbonyl, C_1 - C_4 alkoxycarbonyl, amino, C_1 - C_4 alkylamino, di- C_1 - C_4 alkylamino, C_1 - C_6 alkylthio, C_1 - C_6 -alkylsulfinyl, C_1 - C_6 alkylsulfonyl, C_1 - C_4 alkyl- $S(O)_2O$, C_1 - C_4 haloalkylthio, C_1 - C_4 haloalkylsulfinyl, C_1 - C_4 haloalkylsulfonyl, C_1 - C_4 haloalkyl- $S(O)_2O$, C_1 - C_4 alkyl- $S(O)_2NH$, C_1 - C_4 alkyl- $S(O)_2N(C_1$ - C_4 -alkyl), halogen, nitro, COOH or cyano; or R_{33} and R_{34} together form a C_2 - C_6 alkylene bridge; and

- 22 -

R₃₅ is hydrogen, C₁-C₄alkyl, C₁-C₄alkoxycarbonyl or phenyl which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄-alkyl), halogen, nitro, COOH or cyano; or the group Q₅, and also agronomically acceptable salts of these compounds, the other substituents being defined as under formula I in claim 1. Among the compounds of the formula Ib, preference is furthermore given to those in which the group

-C(O)-Q is located in the 3 position on the pyridine ring, or in which Q is Q₂, R₂₃ being, in particular, hydroxyl, Y being a methylene bridge and m being the number 2. Preference is further given to compounds of the formula Ib in which R is C₁-C₆alkyl or C₁-C₆haloalkyl.

Preferred compounds of the formula I are characterized in that the group -C(O)Q is in the ortho position to a group R. Preference is furthermore given to compounds of the formula I in which a group R is C₁-C₆haloalkyl and in the ortho position to the pyridyl nitrogen. Of particular interest are furthermore compounds of the formula I in which the group -C(O)Q is in the 3 position to the pyridyl nitrogen. In the formula I, p is preferably the number 0. Also to be emphasized are compounds of the formula I in which m is 2 and R is C₁-C₃alkyl, C₁-C₃-haloalkyl, C₁-C₂alkoxymethyl, C₁-C₂alkylthiomethyl, hydroxymethyl, C₁-C₆alkylcarbonyloxymethyl, benzoyloxymethyl, C₁-C₄alkoxycarbonyloxymethyl, chlorine, cyano, C₁-C₃alkoxy, C₁-C₃haloalkoxy, allyloxy, propargyloxy, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl, C₁-C₃alkylsulfonyloxy, C₁-C₂alkylsulfinylmethyl or C₁-C₂alkylsulfonylmethyl. A further group of preferred compounds of the formula I is formed by those compounds in which at least one group R is trifluoromethyl, difluorochloromethyl, pentafluoroethyl or heptafluoro-n-propyl.

Particularly noteworthy compounds of the formula I are those in which Q is a group Q₁ and R₁₆, R₁₈ and R₁₉ are C₁-C₃alkyl and R₁₇ is hydrogen, or Q is a group Q₂ and Y is -CH₂-, -CH₂CH₂- or oxygen, A is -CH₂- and R₂₄₀, R₂₄₁, R₂₄₂ and R₂₄₃ are each hydrogen, or Q is a group Q₃ and R₂₉ is C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl or C₁-C₄alkylaminocarbonyl or di(C₁-C₂-alkyl)aminocarbonyl, or Q is a group Q₄ in which R₃₃, R₃₄ and R₃₅ are C₁-C₃alkyl. In these noteworthy compounds of the formula I, R₂₀, R₂₃, R₂₆ and R₃₀ independently of one another are halogen, thiocyanato, C₁-C₁₂alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₂alkoxy, C₁-C₁₂-

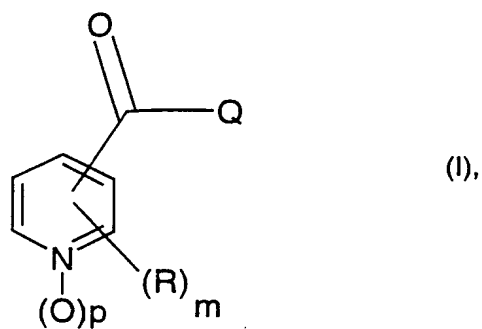
- 23 -

alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂alkenylsulfonyl, C₂-C₁₂-haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₂-alkylthio, C₁-C₄-alkoxycarbonyl-C₁-C₂alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₂alkylsulfonyl, C₁-C₄alkyl-S(O)₂NH, C₁-C₄haloalkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, C₂-C₁₈-alkenylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂alkoxycarbonyloxy, C₁-C₁₂-alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbamoyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may in each case be substituted by C₁-C₄alkyl, C₁-C₄-haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄-alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄-alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄-haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano, or R₂₀, R₂₃, R₂₆ and R₃₀ independently of one another are thienylcarbonyloxy or furylcarbonyloxy which for their part may be substituted by methyl or halogen, or are pyridylcarbonyloxy which for its part may be substituted as stated in claim 1, or R₂₀ is R₃₇R₃₈N, R₇₁R₇₂NNH-, R₂₁R₂₂NC(O)O- or R₇₃R₇₄NC(O)NH-; or R₂₃ is R₄₄R₄₅N, R₇₅R₇₆NNH-, R₄₆R₄₇NC(O)O- or R₇₇R₇₈NC(O)NH-; or R₂₆ is R₅₃R₅₄N, R₇₉R₈₀NNH-, R₅₅R₅₆NC(O)O- or R₈₁R₈₂NC(O)NH-; or R₃₀ is R₆₂R₆₃N, R₈₃R₈₄NNH-, R₆₄R₆₅NC(O)O- or R₈₅R₈₆NC(O)NH-. Very particularly preferably, R₂₀, R₂₃, R₂₆ or R₃₀ are hydroxyl or O⁻M⁺.

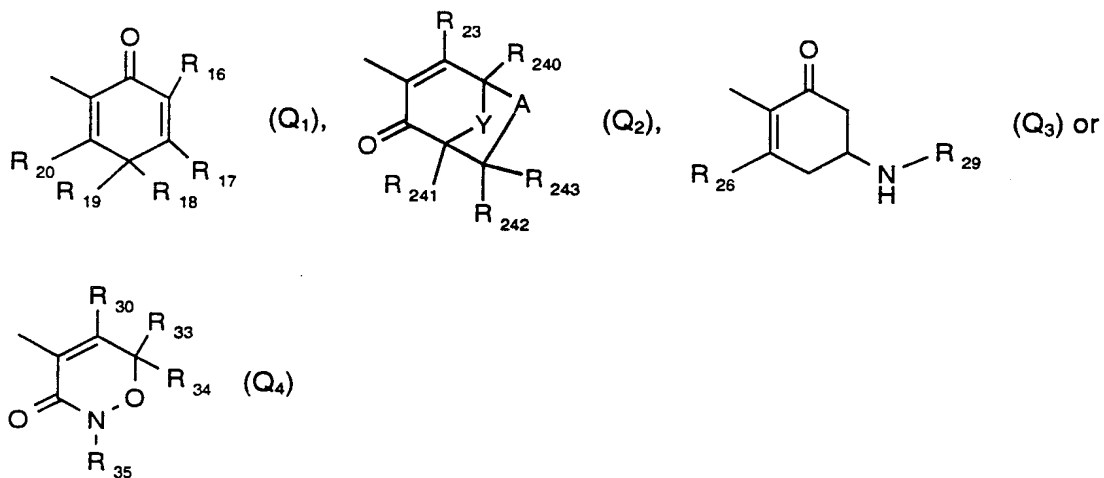
A further preferred group is formed by those compounds of the formula I in which Q is a group Q₅, R₃₆ is C₁-C₄alkyl, C₁-C₄haloalkyl or cyclopropyl and R₀₁ is C₁-C₆alkyl, C₁-C₄-alkoxycarbonylmethyl, C₃-C₆alkenyl, is benzyl or phenyl substituted by methyl, halogen, trifluoromethyl, methoxy, and at least one group R is trifluoromethyl, difluorochloromethyl, pentafluoroethyl or heptafluoro-n-propyl located in the ortho position to the pyridyl nitrogen.

The process according to the invention for preparing compounds of the formula I

- 24 -

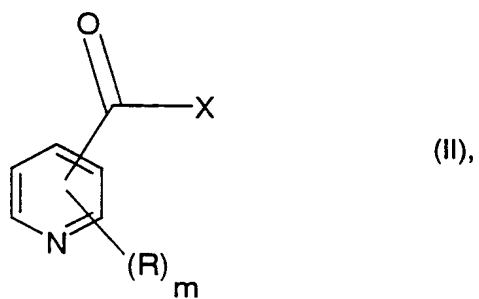


in which R and m are as defined under formula I; p is 0 and Q is the group



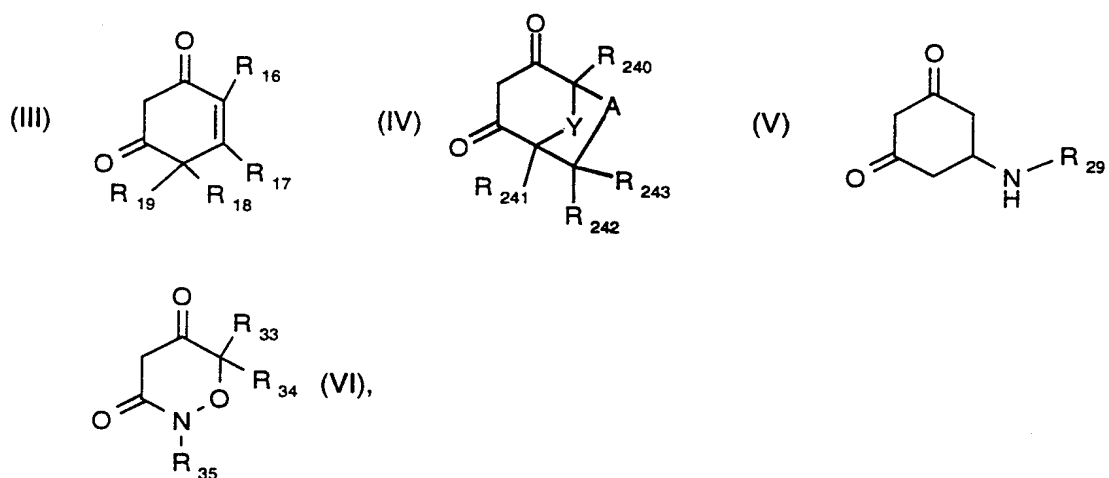
is carried out analogously to known processes (for example those described in WO 97/46530 and EP-A-0 353 187) and comprises

a) reacting a compound of the formula II

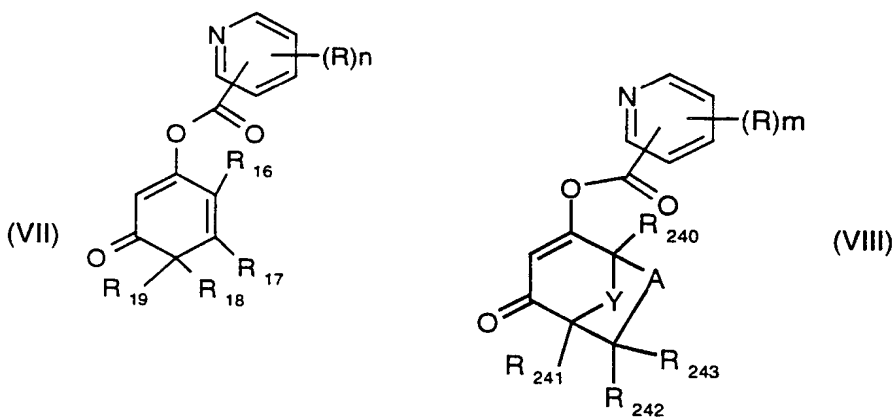


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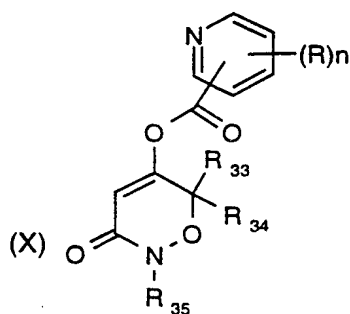
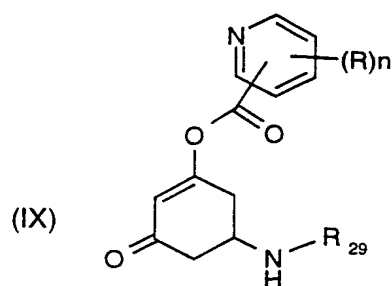
in which R and m are as defined under formula I and X is a leaving group, for example halogen, in an inert organic solvent in the presence of a base with compounds of the formula III, IV, V or VI



in which R_{16} , R_{17} , R_{18} , R_{19} , R_{29} , R_{33} , R_{34} , R_{35} , R_{240} , R_{243} , R_{242} , R_{241} , A and Y are as defined under formula I to give the compounds of the formula VII, VIII, IX or X

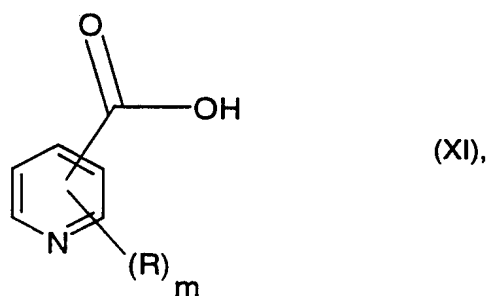


- 26 -

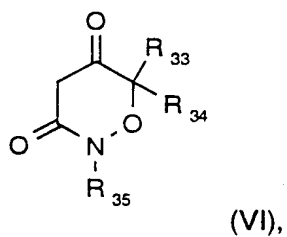
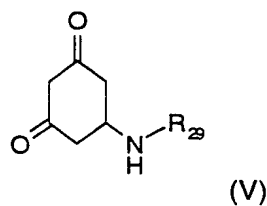
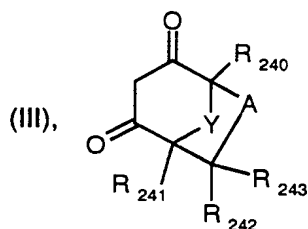
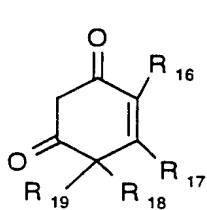


and then isomerizing these compounds, for example in the presence of a base and a catalytic amount of dimethylaminopyridine (DMAP) or a source of cyanide; or

b) reacting a compound of the formula XI

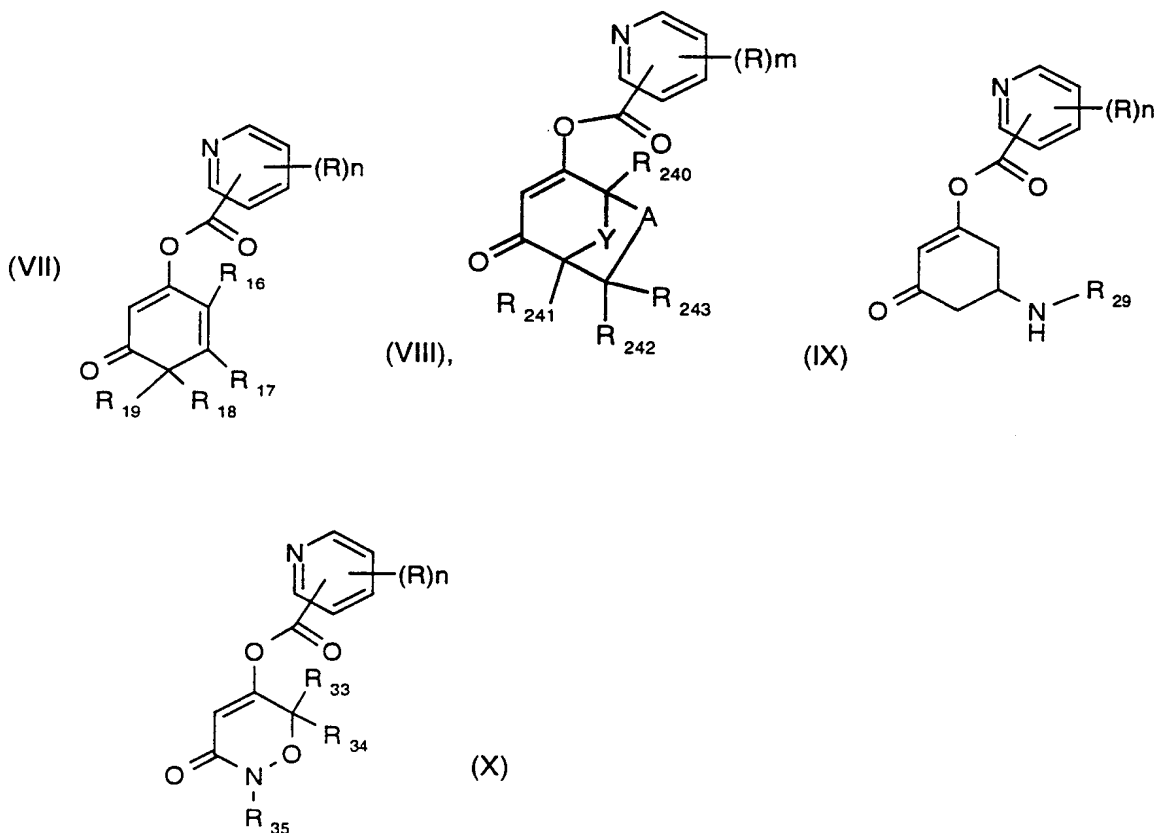


in which R and m are as defined under formula I with compounds of the formula III, IV, V or VI



- 27 -

in which R_{16} , R_{17} , R_{18} , R_{19} , R_{29} , R_{33} , R_{34} , R_{35} , R_{240} , R_{243} , R_{242} , R_{241} , A and Y are as defined under formula I in an inert organic solvent in the presence of a base and a coupling agent to give a compound of the formula VII, VIII, IX or X



and then isomerizing these compounds, for example as described under route a).

Compounds of the formula I in which R_{20} , R_{23} , R_{26} and R_{30} are different from hydroxyl or halogen can be prepared by conversion methods which are generally known from the literature, for example acylations or carbamoylations with appropriate acyl chlorides, from compounds in which R_{20} , R_{23} , R_{26} or R_{30} is hydroxyl in the presence of a suitable base, or they can be prepared by nucleophilic substitution reactions on chlorides of the formula I in which R_{20} , R_{23} , R_{26} or R_{30} is halogen, which are likewise obtainable by known processes by reaction with a chlorinating agent, such as phosgene, thionyl chloride or oxalyl chloride. Here, for example, suitably substituted amines, or hydroxylamines directly, or

- 28 -

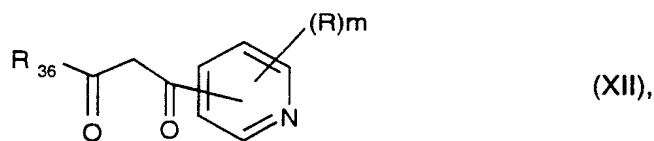
alkylsulfonamides, mercaptans, thiophenols, phenols, $\text{Ar}_1\text{-NH}_2$ or $\text{Ar}_1\text{-SH}$, are employed in the presence of a base, for example 5-ethyl-2-methylpyridine, diisopropylethylamine, triethylamine, sodium bicarbonate, sodium acetate or potassium carbonate.

Compounds of the formula I in which R_{20} , R_{23} , R_{26} or R_{30} comprise thio groups can be oxidized analogously to known standard processes, for example using peracids, for example meta-chloroperoxybenzoic acid (m-CPBA) or peracetic acid, to give the corresponding sulfones and sulfoxides of the formula I. Here, the degree of oxidation at the sulfur atom (SO- or $\text{SO}_2\text{-}$) can be controlled by the amount of oxidizing agent.

The process according to the invention for preparing compounds of the formula I in which R and m are as defined under formula I and Q is a group



in which Z is sulfur, q is 0 and R_{36} and R_{01} are as defined under formula I is carried out analogously to known processes (for example those described in WO 97/43270) and comprises converting a compound of the formula XII

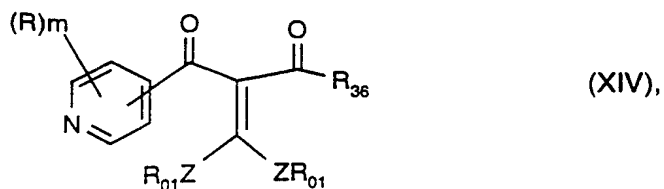


in which R_{36} , R and m are as defined under formula I in the presence of a base, carbon disulfide and an alkylating agent of the formula XIII

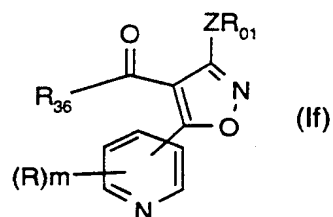
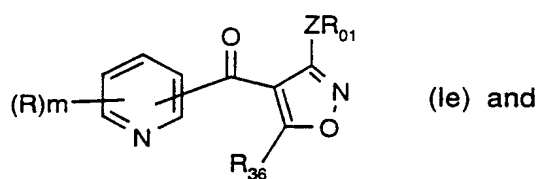


in which R_{01} is as defined under formula I and X_1 is a leaving group, for example halogen or sulfonate, into the compound of the formula XIV

- 29 -



in which Z is sulfur and R, R₀₁, R₃₆ and m are as defined above and then cyclizing this compound using hydroxylamine hydrochloride, in the presence or absence of a solvent, in the presence of a base to give the compounds of the formulae



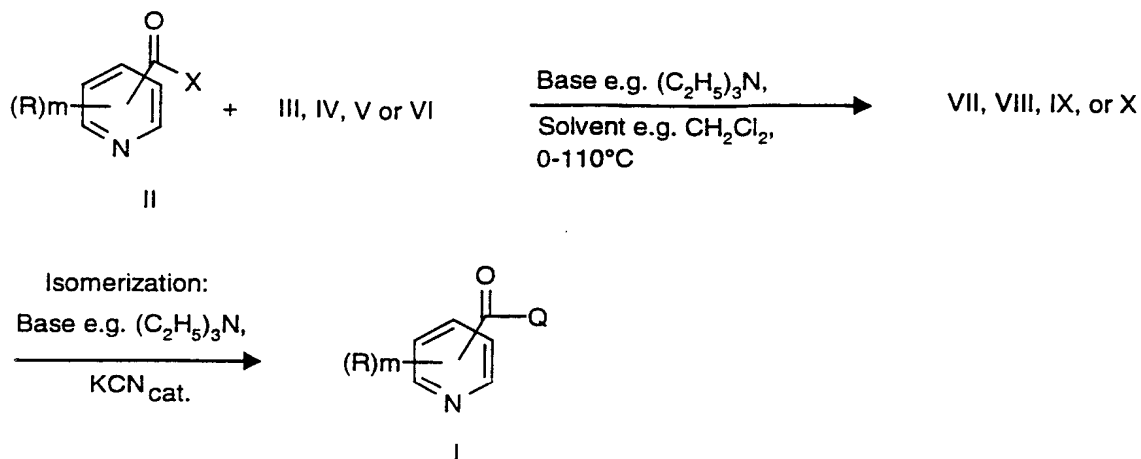
in which Z is sulfur and R, R₃₆, R₀₁ and m are as defined above, and then oxidizing these compounds with an oxidizing agent, for example meta-chloroperbenzoic acid (m-CPBA). The isomers of the formulae Ie and If can be separated using column chromatography and a suitable mobile phase and then purified.

The preparation of the compounds of the formula I in which p is 0 is illustrated in more detail in the reaction schemes 1 and 2 below.

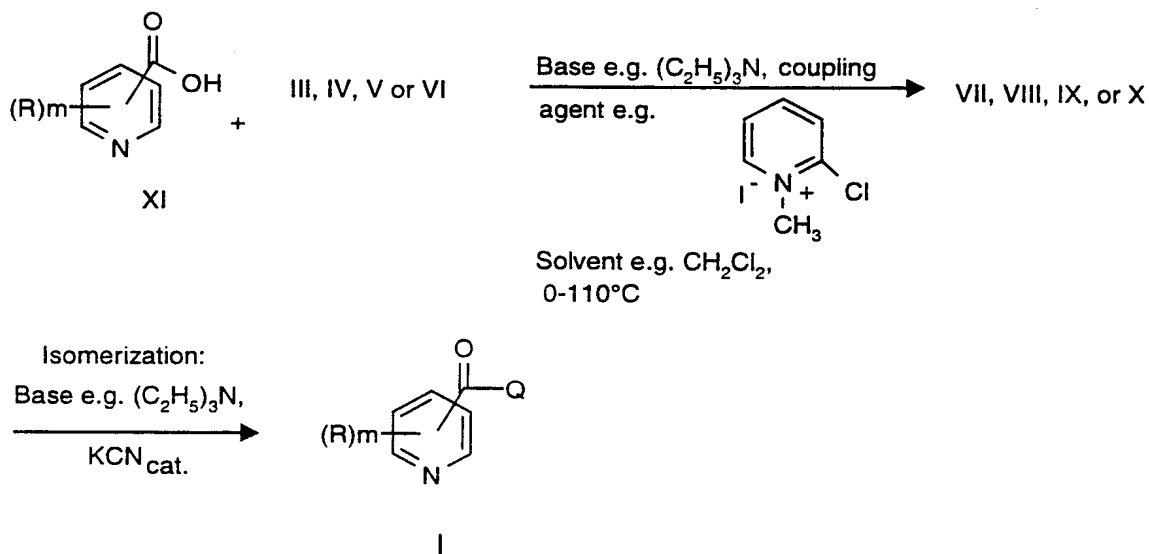
- 30 -

Reaction scheme 1

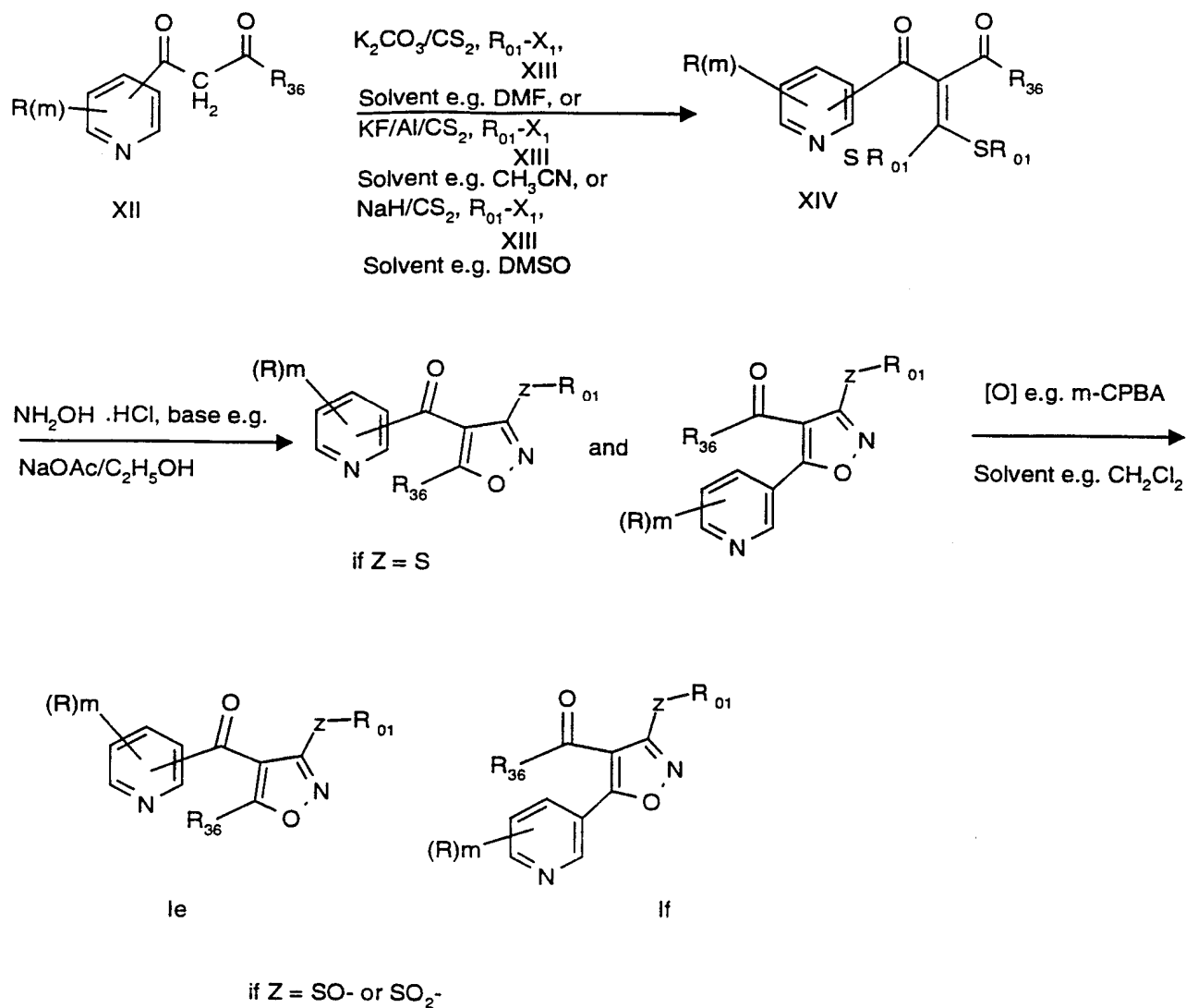
Route a):



Route b):

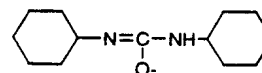


According to this reaction scheme, the compounds of the formula I with the group Q_1 in which R_{20} is hydroxyl, the compounds of the formula I with the group Q_2 in which R_{23} is hydroxyl, the compounds of the formula I with the group Q_3 in which R_{26} is hydroxyl and the compounds of the formula I with the group Q_4 in which R_{30} is hydroxyl can preferably be prepared.

Reaction scheme 2

For preparing the compounds of the formula I in which Q is the groups Q₁ to Q₄ and R₂₀, R₂₃, R₂₆ and R₃₀ are hydroxyl, in accordance with reaction scheme 1, route a), the carboxylic acid derivatives of the formula II in which X is a leaving group, for example halogen, for example iodine, bromine and in particular chlorine, N-oxyphthalimide or N,O-

dimethylhydroxylamino or part of an activated ester, for example



(formed from dicyclohexylcarbodiimide (DCC) and the corresponding carboxylic acid) or

- 32 -



(EDC) and the corresponding carboxylic acid) are employed. These compounds are reacted in an inert organic solvent, for example a halogenated hydrocarbon, for example dichloromethane, a nitrile, for example acetonitrile, or an aromatic hydrocarbon, for example toluene, and in the presence of a base, for example an alkylamine, for example triethylamine, an aromatic amine, for example pyridine or 4-dimethylaminopyridine (DMAP), with the dione derivatives of the formula III, IV, V or VI to give the isomeric enol ethers of the formulae VII, VIII, IX and X. This esterification is carried out at temperatures of from 0°C to 110°C.

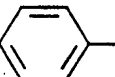
The isomerization of the ester derivatives of the formulae VII, VIII, IX and X to the dione derivatives of the formula I (in which R₂₀, R₂₃, R₂₆ and R₃₀ are hydroxyl) can be carried out, for example, analogously to EP 369 803 in the presence of a base, for example an alkylamine, for example triethylamine, a carbonate, for example potassium carbonate, and a catalytic amount of DMAP or a cyanide source, for example acetone cyanohydrin or potassium cyanide.

According to reaction scheme 1, route b), the desired diones of the formula I (in which R₂₀, R₂₃, R₂₆ and R₃₀ are hydroxyl) can be obtained, for example, in analogy to Chem. Lett. 1975, 1045 by esterifying the carboxylic acids of the formula XI with the dione derivatives of the formula III, IV, V or VI in an inert solvent, for example a halogenated hydrocarbon, for example dichloromethane, a nitrile, for example acetonitrile, or an aromatic hydrocarbon, for example toluene, in the presence of a base, for example an alkylamine, for example triethylamine, and a coupling agent, for example 2-chloro-1-methylpyridinium iodide. Depending on the solvent used, this esterification is carried out at temperatures of from 0°C to 110°C, affording initially, as described under route a), the isomeric ester of the formula I which can be isomerized as described under route a), for example in the presence of a base and a catalytic amount of DMAP, or a cyanide source, to give the desired dione derivative of the formula I (R₂₀, R₂₃, R₂₆ and R₃₀ are hydroxyl).

The preparation of the compounds of the formula I in which Q is the group Q₅ can be carried out in accordance with reaction scheme 2 by reacting the β-diketone derivative of

- 33 -

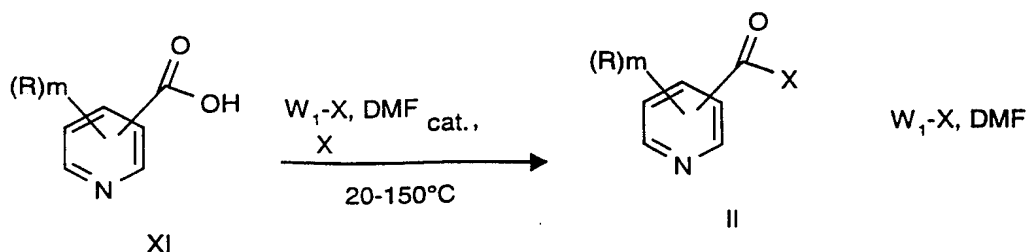
the formula XII, for example in analogy to Synthesis 1991, 301; *ibid.* 1988, 793; or Tetrahedron 32, 3055 (1976) with carbon disulfide in the presence of a base, for example a carbonate, for example potassium carbonate, a metal hydride, for example sodium hydride, or potassium fluoride on aluminium, and an alkylating agent of the formula XIII in which X_1 is a leaving group, for example halogen, for example iodine, bromine and in particular

chlorine, $R_{25}OSO_2O^-$, $CH_3SO_2O^-$ or CH_3 -- SO_2O^- . This reaction is preferably

carried out in the presence of a solvent, for example an amide, for example N,N-dimethylformamide (DMF), a sulfoxide, for example dimethylsulfoxide (DMSO), or a nitrile, for example acetonitrile. The ketene thioacetal of the formula XIV which is formed is cyclized with the aid of hydroxylamine hydrochloride in the presence of a base, for example sodium acetate, in a solvent, for example an alcohol, for example ethanol, or an ether, for example tetrahydrofuran, to give the compound of the formula Ie in which Z is sulfur. This cyclization reaction is carried out at temperatures of from 0°C to 100°C. If appropriate, compounds of the formulae Ie and If (Z is sulfur) can be oxidized analogously to known standard processes, for example with peracids, for example meta-chloroperbenzoic acid (m-CPBA) or peracetic acid, to give the corresponding sulfones and sulfoxides of the formulae Ie and If (Z = SO- or SO₂-). Here, the degree of oxidation at the sulfur atom (Z = SO- or SO₂-) can be controlled by the amount of oxidizing agent.

Oxidations to the compounds of the formulae Ie and If (Z is SO- or SO₂-) are carried out as described, for example, in H.O. House, "Modern Synthetic Reactions" W. A. Benjamin, Inc., Menlo Park, California, 1972, pages 334-335 and 353-354.

The activated carboxylic acid derivatives of the formula II in reaction scheme 1 (route a) in which X is a leaving group, for example halogen, for example bromine, iodine or in particular chlorine, can be prepared by known standard processes, as described, for example, in C. Ferri "Reaktionen der organischen Synthese" [Reactions of Organic Synthesis], Georg Thieme Verlag, Stuttgart, 1978, page 461 ff. This is shown in reaction scheme 3 below.

Reaction scheme 3

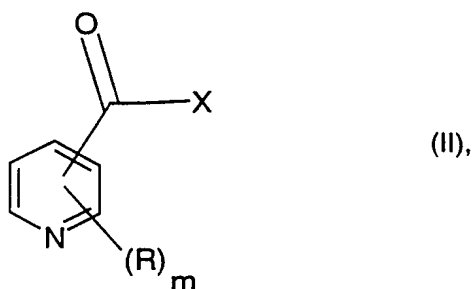
According to reaction scheme 3, the compounds of the formula II (X=leaving group) or II (X=halogen) are prepared, for example, by employing a halogenating agent, for example a thionyl halide, for example thionyl chloride or thionyl bromide; a phosphorus halide or phosphorus oxyhalide, for example phosphorus pentachloride or phosphorus oxychloride or phosphorus pentabromide or phosphoryl bromide; or an oxalyl halide, for example oxalyl chloride, or by employing a reagent for the formation of activated esters, for example N,N'-dicyclohexylcarbodiimide (DCC) or N-ethyl-N'-(3-dimethylaminopropyl)carbodiimide (EDC) of the formula X. For the compound of the formula X used as halogenating agents, X is a leaving group, for example halogen, for example fluorine, bromine or iodine and in particular chlorine, and W₁ is, for example, PCl₂, SOCl, SOBr or ClCOCO.

The reaction is carried out in the presence or absence of an inert organic solvent, for example in aliphatic, halogenated aliphatic, aromatic or halogenated aromatic hydrocarbons, for example n-hexane, benzene, toluene, xylenes, dichloromethane, 1,2-dichloroethane or chlorobenzene, at reaction temperatures in the range of from -20°C to the reflux temperature of the reaction mixture, preferably at 40-150°C, and in the presence of a catalytic amount of N,N-dimethylformamide. Such reactions are generally known and described in the literature in various variations with respect to the leaving group X.

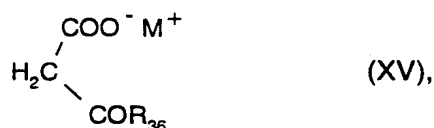
The compounds of the formulae III, IV, V and VI are known and can be prepared analogously to the methods described, for example, in WO 92/07837, DE-A-3818958, EP-A-0 338 992 and DE-A-3902818.

The compounds of the formula XII in reaction scheme 2 can be obtained by standard processes, for example from the corresponding compounds of the formula II

- 35 -



in which R and m are as defined above and X is a leaving group, for example halogen, for example via Claisen condensation, or from the compounds of the formula II by reaction with a ketocarboxylic acid salt of the formula XV



in which R₃₆ is as defined under formula I and M⁺ is an alkali metal ion (cf., for example, WO 96/26192).

The compounds of the formulae II and XI are known and can be prepared analogously to the methods described, for example, in WO 97/46530, EP-A-0 353 187, Heterocycles, 48, 779 (1998), Heterocycles, 46, 129 (1997), or Tetrahedron Letters, 1749 (1998).

For preparing all other compounds of the formula I functionalized according to the definition of (R)_m, there is a large number of known standard processes available, for example alkylation, halogenation, acylation, amidation, oximation, oxidation and reduction, and the choice of the suitable preparation processes depends on the properties (reactivities) of the substituents in the intermediates in question.

All further compounds originating from the scope of the formula I can be prepared in a simple manner, taking into account the chemical properties of the pyridyl or Q moiety.

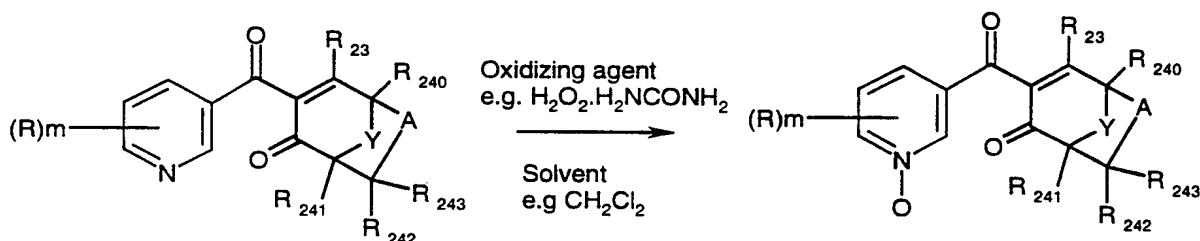
The end products of the formula I can be isolated in a customary manner by concentration or evaporation of the solvent and be purified by recrystallization or trituration of the solid residue in solvents in which they are only sparingly soluble, such as ethers, aromatic

- 36 -

hydrocarbons or chlorinated hydrocarbons, by distillation or by means of column chromatography and a suitable mobile phase.

Furthermore, it is known to the person skilled in the art in which order certain reactions have to be carried out advantageously to avoid possible side reactions. Unless a targeted synthesis is carried out for isolating pure isomers, the product may be obtained as a mixture of two or more isomers. The isomers can be separated by methods known per se.

Compounds of the formula I in which p is 1, i.e. the corresponding N-oxides of the formula I, can be prepared by reacting a compound of the formula I in which p is 0 with a suitable oxidizing agent, for example with the H_2O_2 urea adduct, in the presence of an acid anhydride, for example trifluoroacetic anhydride. This reaction sequence is demonstrated using the example of group Q_2 below:

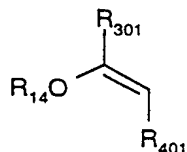


Compounds of the formula I in which R in the ortho position to the pyridine nitrogen is 1-chloro- C_1 - C_2 alkyl, 1-hydroxy- C_1 - C_2 alkyl, 1-(C_1 - C_6 alkylcarbonyloxy)- C_1 - C_2 alkyl, 1-benzoyloxy- C_1 - C_2 alkyl, 1-(C_1 - C_4 alkoxycarbonyloxy)- C_1 - C_2 alkyl, 1-(C_1 - C_4 alkylthio)- C_1 - C_2 alkyl, 1-(C_1 - C_4 alkylsulfinyl)- C_1 - C_2 alkyl, 1-(C_1 - C_4 alkylsulfonyl)- C_1 - C_2 alkyl, 1-thiocyanato- C_1 - C_2 alkyl, 1-cyano- C_1 - C_2 alkyl, can also be prepared, for example, by heating an N-oxide of the formula I under known reaction conditions, for example in the presence of tosyl chloride (see, for example, Parham, W. E.; Sloan, K. B.; Reddy, K. R.; Olson, P. E.; *J Org Chem* 1973, **38**, 927) or in the presence of an acid anhydride (see, for example, Konno, K.; Hashimoto, K.; Shirahama, H.; Matsumoto, T.; *Heterocycles* 1986, **24**, 2169), followed, if appropriate, by subsequent conversion.

The compounds of the formula XXIIa are synthesized analogously to known processes, for example those mentioned in *Heterocycles*, 46, 129 (1997) or *Helvetica Chimica Acta* 71, 596 (1988), and comprises either

a) acylating a compound of the formula XVI

- 37 -



(XVI),

in which R_{301} is hydrogen or $\text{C}_1\text{-C}_6$ alkyl;

R_{401} is hydrogen, $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_2\text{-C}_6$ alkenyl, $\text{C}_3\text{-C}_6$ cycloalkyl, $\text{C}_1\text{-C}_6$ alkoxy, $\text{C}_1\text{-C}_6$ alkylthio, $\text{C}_1\text{-C}_6$ alkylsulfinyl, $\text{C}_1\text{-C}_6$ haloalkyl, 1-($\text{C}_1\text{-C}_6$ alkylcarbonyloxy)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylthio)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylsulfinyl)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylsulfonyl)- $\text{C}_1\text{-C}_6$ alkyl, 1-thiocyanato- $\text{C}_1\text{-C}_6$ alkyl, 1-cyano- $\text{C}_1\text{-C}_6$ alkyl, phenyl, where the phenyl groups may be mono- or polysubstituted by halogen, methyl, ethyl, trifluoromethyl, methoxy or nitro, or is a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where the ring system is either attached directly or via a $\text{C}_1\text{-C}_4$ alkylene group to the double bond, and each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms and the ring system for its part may be mono-, di- or trisubstituted by $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_1\text{-C}_6$ haloalkyl, $\text{C}_3\text{-C}_6$ alkenyl, $\text{C}_3\text{-C}_6$ haloalkenyl, $\text{C}_3\text{-C}_6$ alkynyl, $\text{C}_3\text{-C}_6$ haloalkynyl, $\text{C}_1\text{-C}_6$ alkoxy, $\text{C}_1\text{-C}_6$ haloalkoxy, $\text{C}_3\text{-C}_6$ alkenyloxy, $\text{C}_3\text{-C}_6$ alkynyloxy, mercapto, $\text{C}_1\text{-C}_6$ alkylthio, $\text{C}_1\text{-C}_6$ haloalkylthio, $\text{C}_3\text{-C}_6$ alkenylthio, $\text{C}_3\text{-C}_6$ haloalkenylthio, $\text{C}_3\text{-C}_6$ alkynylthio, $\text{C}_2\text{-C}_5$ alkoxyalkylthio, $\text{C}_3\text{-C}_5$ acetylalkylthio, $\text{C}_3\text{-C}_6$ alkoxycarbonylalkylthio, $\text{C}_2\text{-C}_4$ cyanoalkylthio, $\text{C}_1\text{-C}_6$ alkylsulfinyl, $\text{C}_1\text{-C}_6$ haloalkylsulfinyl, $\text{C}_1\text{-C}_6$ alkylsulfonyl, $\text{C}_1\text{-C}_6$ haloalkylsulfonyl, aminosulfonyl, $\text{C}_1\text{-C}_2$ alkylaminosulfonyl, $\text{C}_2\text{-C}_4$ dialkylaminosulfonyl, $\text{C}_1\text{-C}_3$ alkylene- R_{87} , $\text{NR}_{88}\text{R}_{89}$, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by $\text{C}_1\text{-C}_3$ alkyl, $\text{C}_1\text{-C}_3$ haloalkyl, $\text{C}_1\text{-C}_3$ alkoxy, $\text{C}_1\text{-C}_3$ -haloalkoxy, halogen, cyano or nitro and where substituents on nitrogen in the heterocyclic ring are different from halogen;

R_{87} is $\text{C}_1\text{-C}_3$ alkoxy, $\text{C}_2\text{-C}_4$ alkoxycarbonyl, $\text{C}_1\text{-C}_3$ alkylthio, $\text{C}_1\text{-C}_3$ alkylsulfinyl, $\text{C}_1\text{-C}_3$ alkylsulfonyl or phenyl, where phenyl for its part may be substituted by $\text{C}_1\text{-C}_3$ alkyl, $\text{C}_1\text{-C}_3$ haloalkyl, $\text{C}_1\text{-C}_3$ -alkoxy, $\text{C}_1\text{-C}_3$ haloalkoxy, halogen, cyano or nitro;

R_{88} is hydrogen or $\text{C}_1\text{-C}_6$ alkyl and

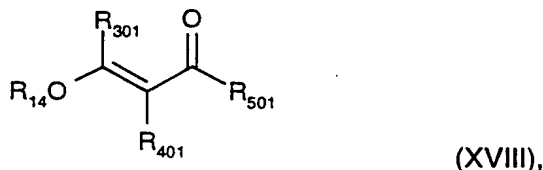
R_{89} is $\text{C}_1\text{-C}_6$ alkyl or $\text{C}_1\text{-C}_6$ alkoxy;

with a compound of the formula XVII

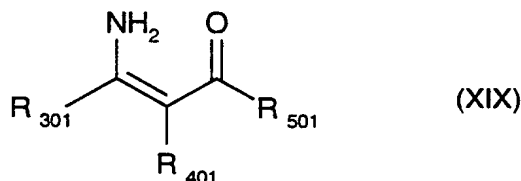
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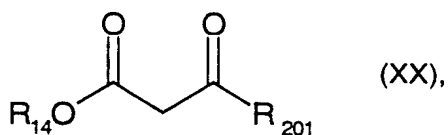
in which R_{501} is $\text{C}_1\text{-C}_6$ haloalkyl and X_2 is $\text{O}(\text{CO})\text{R}_{501}$ or halogen to give the compound of the formula XVIII



in which R_{301} , R_{401} , R_{501} and R_{14} are as defined above, in the presence of a base, for example an aromatic amine, for example pyridine, and subsequently replacing the alkoxy group by the amino group using ammonia in an organic solvent, for example a halogenated hydrocarbon, for example dichloromethane, or a nitrile, for example acetonitrile. The resulting compound of the formula XIX



is subsequently condensed with a compound of the formula XX



in which R_{201} is $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_2\text{-C}_6$ alkenyl, $\text{C}_2\text{-C}_6$ haloalkenyl, $\text{C}_2\text{-C}_6$ alkynyl, $\text{C}_2\text{-C}_6$ -haloalkynyl, $\text{C}_3\text{-C}_6$ cycloalkyl, $\text{C}_1\text{-C}_6$ haloalkyl, 1-($\text{C}_1\text{-C}_6$ alkylcarbonyloxy)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylthio)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylsulfinyl)- $\text{C}_1\text{-C}_6$ alkyl, 1-($\text{C}_1\text{-C}_6$ alkylsulfonyl)- $\text{C}_1\text{-C}_6$ alkyl, 1-thiocyanato- $\text{C}_1\text{-C}_6$ alkyl, 1-cyano- $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_1\text{-C}_6$ alkoxy- $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_1\text{-C}_6$ alkoxycarbonyl- $\text{C}_1\text{-C}_6$ alkoxy, $\text{C}_1\text{-C}_6$ alkylthio- $\text{C}_1\text{-C}_6$ alkoxy, phenyl, benzyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, benzylthio, benzylsulfinyl or benzylsulfonyl, where the phenyl groups may be mono- or polysubstituted at least by halogen, methyl, ethyl, trifluoromethyl, methoxy or nitro, or is a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where the ring system is attached either directly or via a $\text{C}_1\text{-}$

- 39 -

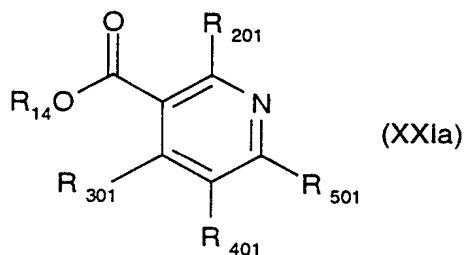
C₄-alkylene group and each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃-R₉₀, NR₉₁R₉₂, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on nitrogen in the heterocyclic ring are different from halogen;

R₉₀ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

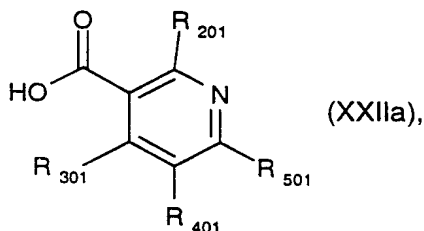
R₉₁ is hydrogen or C₁-C₆alkyl and

R₉₂ is C₁-C₆alkyl or C₁-C₆alkoxy and

R₁₄ is as defined above, and the resulting compound of the formula XXIa



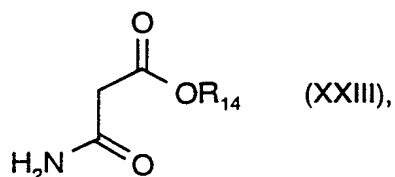
is subsequently hydrolysed to give the compound of the formula XXIIa



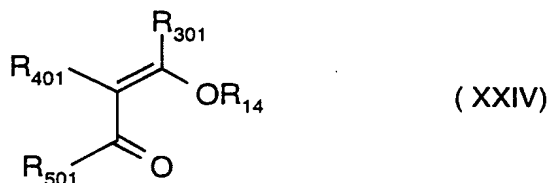
in which R₂₀₁, R₃₀₁, R₄₀₁ and R₅₀₁ are as defined above, or

b) condensing a compound of the formula XXIII

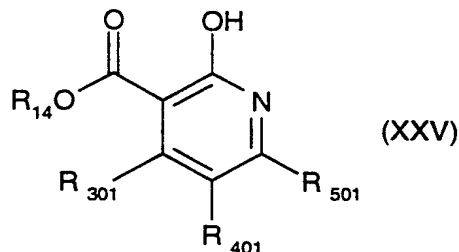
- 40 -



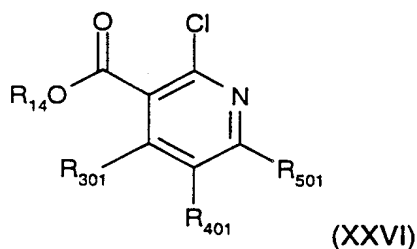
in which R₁₄ is as defined above with a compound of the formula XXIV



and chlorinating the resulting compound of the formula XXV



in which R₃₀₁, R₄₀₁ and R₅₀₁ are as defined above and R₁₄ is C₁-C₄alkyl to give compounds of the formula XXVI



in which R₃₀₁, R₄₀₁, R₅₀₁ and R₁₄ are as defined above (using, for example, POCl₃), and subsequently reacting this compound with a nucleophile of the formula XXVII



In which Z is SH, OH or amino and R₁₅₀ is C₁-C₆alkyl, C₃-C₆alkenyl, C₃-C₆halogenalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, phenyl, benzyl, where the phenyl and benzyl groups for their part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, is C₁-C₄alkoxy-C₁-C₄alkyl or C₁-C₄-alkylthio-C₁-C₄alkyl, C₁-C₄alkylsulfinyl-C₁-C₄alkyl, C₁-C₄alkylsulfonyl-C₁-C₄alkyl, or a five- to

- 41 -

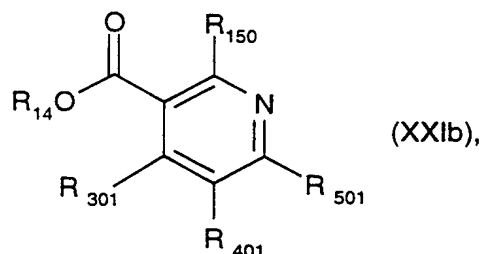
ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄-cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃-alkylene-R₉₃, NR₉₄R₉₅, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃-haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on nitrogen in the heterocyclic ring are different from halogen;

R₉₃ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

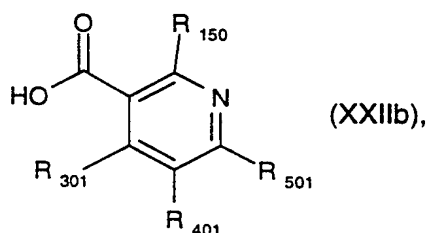
R₉₄ is hydrogen or C₁-C₆alkyl and

R₉₅ is C₁-C₆alkyl or C₁-C₆alkoxy;

in the presence of a base to give compounds of the formula XXIb



in which R₁₄, R₁₅₀, R₃₀₁, R₄₀₁ and R₅₀₁ are as defined above, and subsequently hydrolysing the resulting compound to give the compound of the formula XXIIb

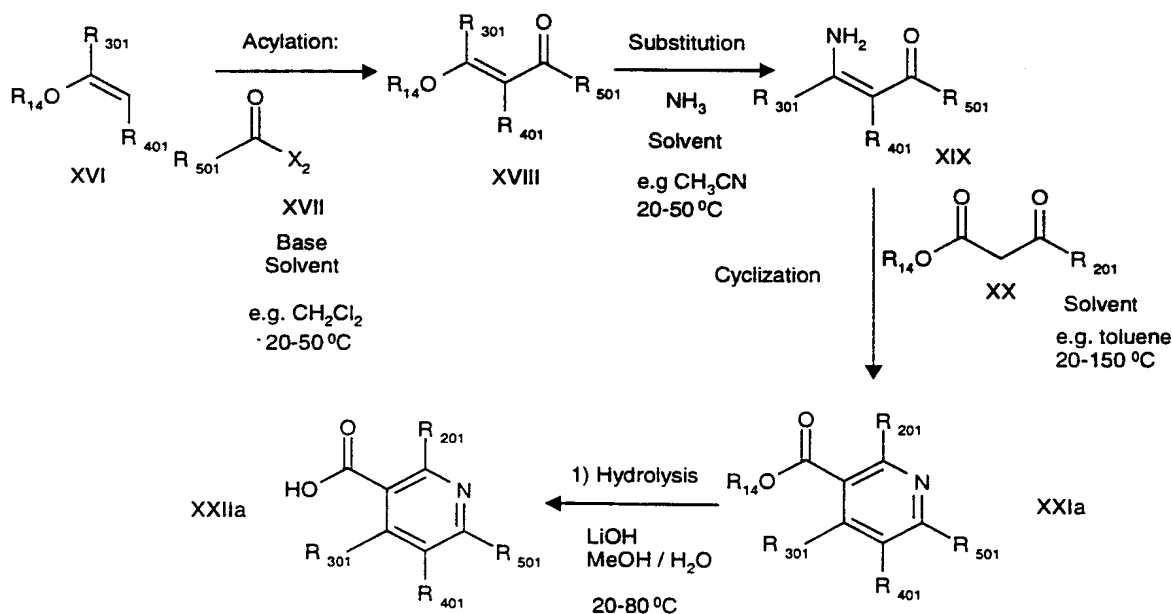


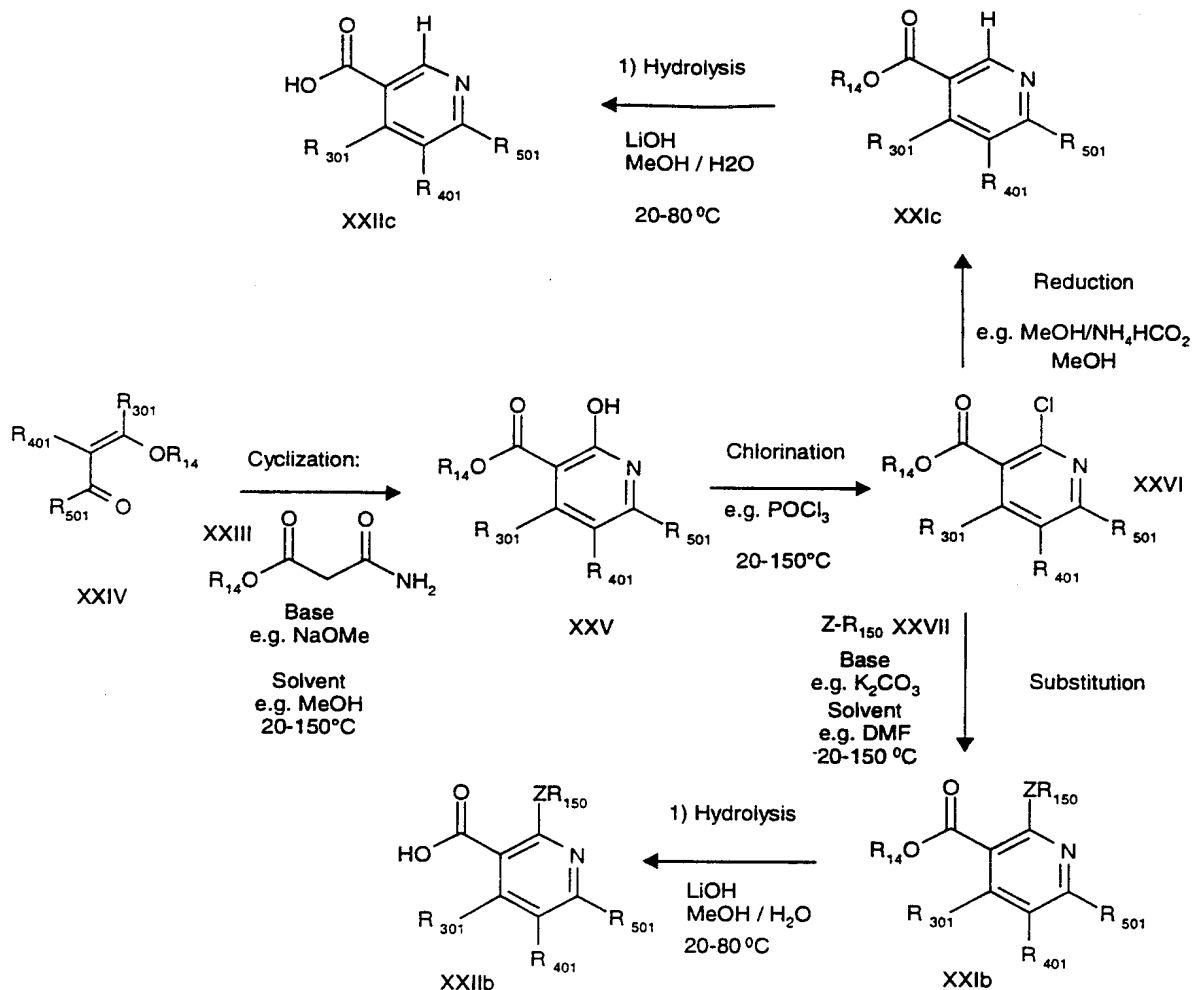
- 42 -

in which R_{150} , R_{301} , R_{401} and R_{501} are as defined.

Compounds of the formula XXIb in which R_{150} is fluorine are prepared by reacting a compound of the formula XXVI in the presence of a polar aprotic solvent, for example acetonitrile, dimethylformamide or sulfolane, with potassium fluoride in the presence or absence of a catalytic amount of 18-crown-6. Compounds of the formula XXIc in which R_{150} is hydrogen are prepared by reducing the chlorine group in the formula XXVI, for example using hydrogen in the presence of a suitable metal catalyst or using ammonium formate in a suitable solvent. The preparation of the compounds of the formula XXIIa, or XXIIb and XXIIc is illustrated in more detail in the reaction schemes 4 and 5 below.

Reaction scheme 4



Reaction scheme 5:

For preparing all other compounds of the formula I which are functionalized according to the definition of R₂₀₁ (R₁₅₀) to R₅₀₁, a large number of known standard processes is suitable, for example alkylation, halogenation, acylation, amidation, oximation, oxidation and reduction, the choice of the suitable preparation processes depending on the properties (reactivities) of the substituents in the intermediates in question.

The novel compounds of the formula IIb in which R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl, heptafluoro-n-propyl or trichloromethyl, R_{X1} is C₁-C₆alkyl and Q and R are as defined under formula I can be prepared by generally known processes via 3-alkoxycarbonyl-4-perhaloalkylpyridine N-oxides of the formula XXVIII according to

- 44 -

reaction scheme 5 by preparing, using suitable chlorination conditions and separation processes, the 6-chloro-4-haloalkyl-3-nicotinic esters of the formula XXX and then converting these compounds with a nucleophile of the formula XXXI



in which Z_{01} is SH, hydroxyl, halogen or amino and R_{151} is hydrogen, C_1 - C_6 alkyl, C_3 - C_6 alkenyl, C_3 - C_6 haloalkenyl, C_3 - C_6 alkynyl, halogen, C_3 - C_6 haloalkynyl, C_1 - C_6 alkylsulfonyl, C_1 - C_6 -haloalkyl, phenyl, benzyl, where the phenyl and benzyl groups for their part may be substituted by C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_1 - C_3 alkoxy, C_1 - C_3 haloalkoxy, halogen, cyano or nitro, is C_1 - C_4 alkoxy- C_1 - C_4 alkyl or C_1 - C_4 alkylthio- C_1 - C_4 alkyl, C_1 - C_4 alkylsulfinyl- C_1 - C_4 alkyl, C_1 - C_4 alkylsulfonyl- C_1 - C_4 alkyl, or a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and the ring system for its part may be mono-, di- or trisubstituted by

C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_3 - C_6 alkenyl, C_3 - C_6 haloalkenyl, C_3 - C_6 alkynyl, C_3 - C_6 -haloalkynyl, C_1 - C_6 alkoxy, C_1 - C_6 haloalkoxy, C_3 - C_6 alkenyloxy, C_3 - C_6 alkynyloxy, mercapto, C_1 - C_6 alkylthio, C_1 - C_6 haloalkylthio, C_3 - C_6 alkenylthio, C_3 - C_6 haloalkenylthio, C_3 - C_6 alkynylthio, C_2 - C_5 alkoxyalkylthio, C_3 - C_5 acetylalkylthio, C_3 - C_6 alkoxycarbonylalkylthio, C_2 - C_4 cyanoalkylthio, C_1 - C_6 alkylsulfinyl, C_1 - C_6 haloalkylsulfinyl, C_1 - C_6 alkylsulfonyl, C_1 - C_6 haloalkylsulfonyl, aminosulfonyl, C_1 - C_2 alkylaminosulfonyl, C_2 - C_4 dialkylaminosulfonyl, C_1 - C_3 alkylene- R_{96} , $NR_{97}R_{98}$, halogen, cyano, nitro, phenyl or benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_1 - C_3 alkoxy, C_1 - C_3 -haloalkoxy, halogen, cyano or nitro,

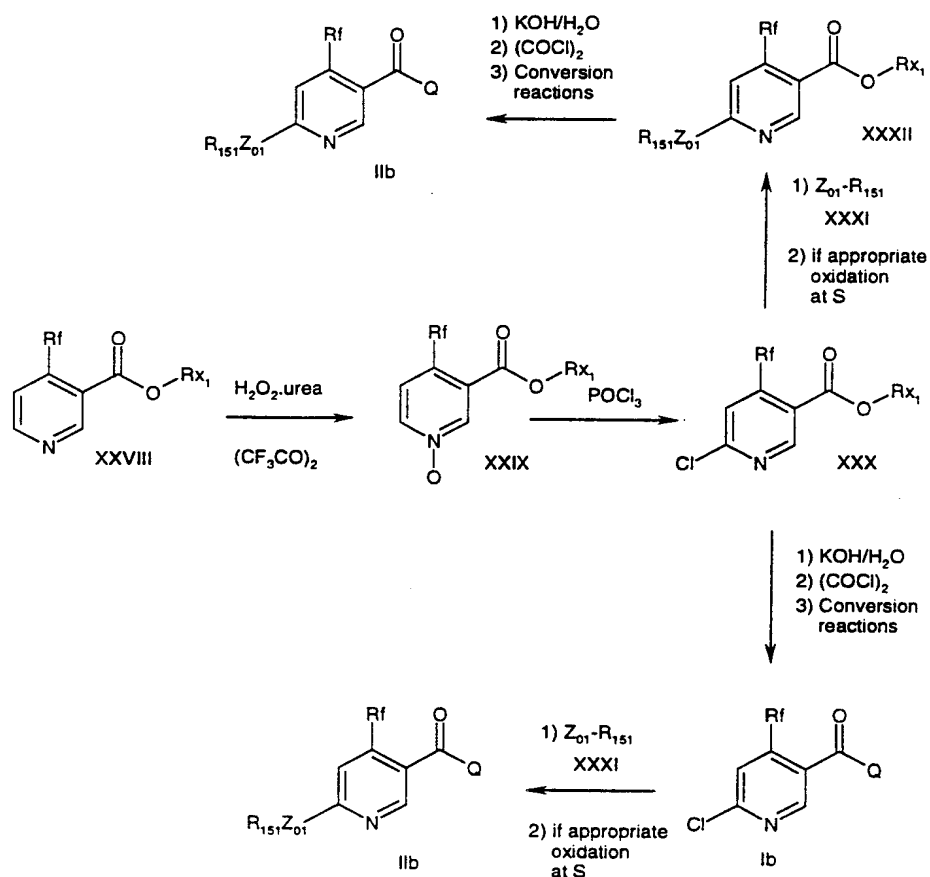
R_{96} is C_1 - C_3 alkoxy, C_2 - C_4 alkoxycarbonyl, C_1 - C_3 alkylthio, C_1 - C_3 alkylsulfinyl, C_1 - C_3 alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_1 - C_3 -alkoxy, C_1 - C_3 haloalkoxy, halogen, cyano or nitro;

R_{97} is hydrogen or C_1 - C_6 alkyl and

R_{98} is C_1 - C_6 alkyl or C_1 - C_6 alkoxy;

and where substituents on nitrogen in the heterocyclic ring are different from halogen, using reaction processes which are generally known to the person skilled in the art, into the 6-substituted 4-perhaloalkylnicotinic acids of the formula XXXII and their subsequent products of the formulae IIb and Ib as described in reaction scheme 1. This is shown in reaction scheme 6 below.

- 45 -

Reaction scheme 6:

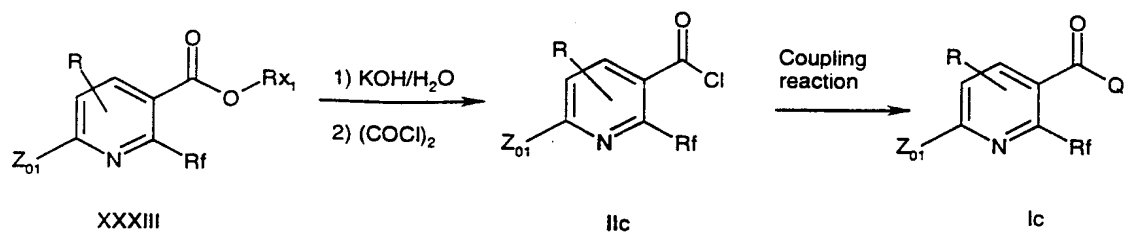
According to this reaction scheme, it is preferably possible to prepare the compounds of the formula I with the group Q₁ in which R₂₀ is hydroxyl, the compounds of the formula I with the group Q₂ in which R₂₃ is hydroxyl, the compounds of the formula I with the group Q₃ in which R₂₆ is hydroxyl and the compounds of the formula I with the group Q₄ in which R₃₀ is hydroxyl.

6-substituted 2-haloalkylnicotinic acid compounds of the formula Ic can be prepared, for example, from the corresponding 2-haloalkyl-3-alkoxycarbonyl-2-pyridines XXXIII in which R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl, heptafluoro-n-propyl or trichloromethyl and R_{1x} is C₁-C₆alkyl and R is as defined under formula I, by hydrolysis into

- 46 -

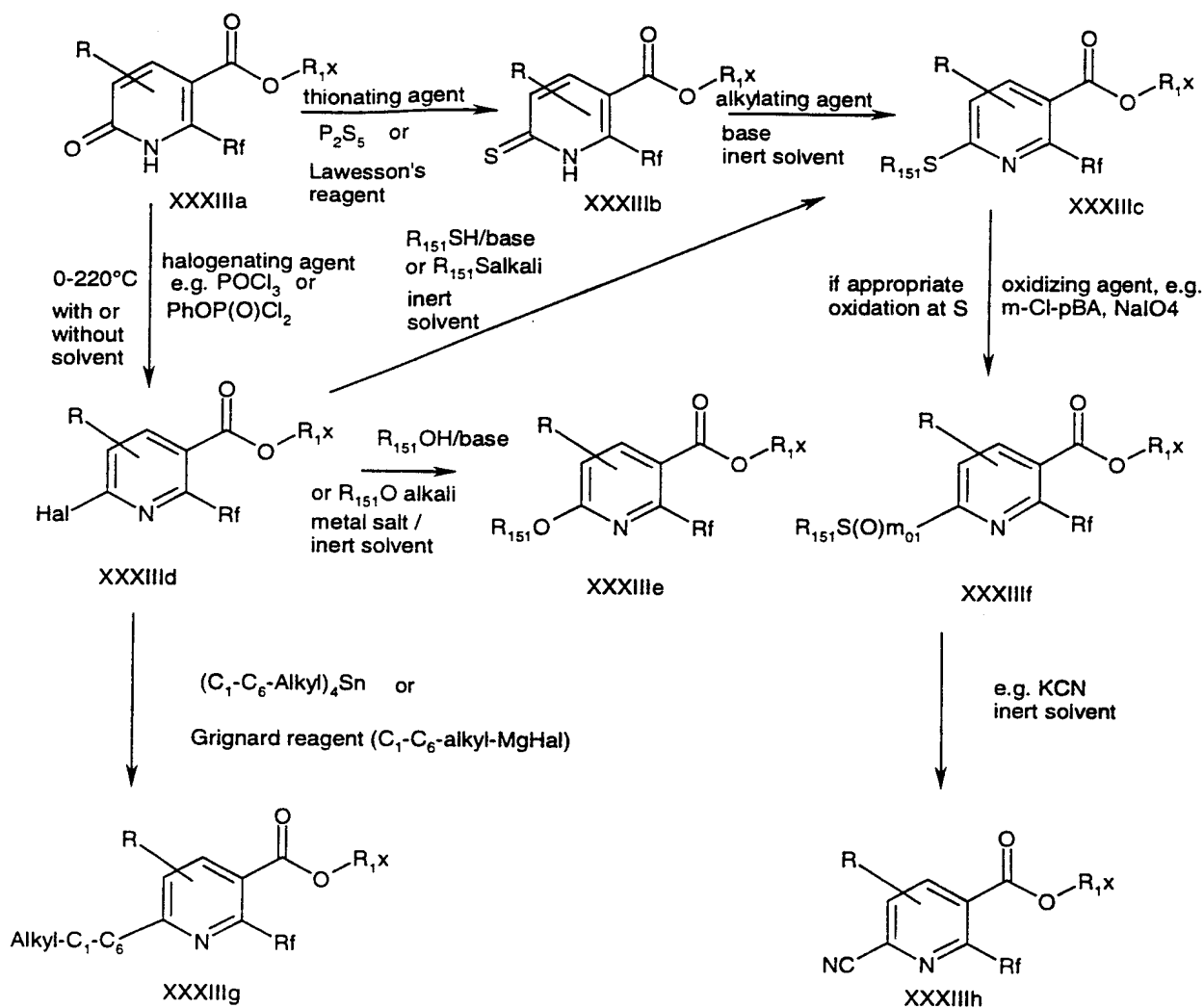
the corresponding carboxylic acids and their subsequent activation, for example by conversion into an acyl halide (IIc). (Reaction scheme 7).

Reaction scheme 7:



Their precursors of the formulae XXXIIIa, XXXIIIb, XXXIIIc, XXXIIId, XXXIIIe, XXXIII f, XXXIIIg and XXXIIIh are likewise accessible by conversion processes known to the person skilled in the art (reaction scheme 7). 2-Trifluoromethyl-3-ethoxycarbonyl-2-pyridone (formula XXXIIIa in which R is hydrogen, R_{1x} is ethyl and R_f is trifluoromethyl) in particular is known from Org. Process Research & Development, 1, 370 (1997).

- 47 -



Reaction scheme 8 (intermediates of the formulae XXXIIIa-XXXIIIh)

Intermediates of the formulae XXXIIIa to XXXIIIh can be obtained by reacting, for example for preparing a 6-halo derivative of the formula XXXIIIId, a pyridone of the formula XXXIIIa (preparation according to Org. Process Research & Development, 1, 370 (1997) or scheme 8) with a halogenating agent, for example phosphorus oxychloride, phosphorus oxybromide or phenyl dichlorophosphate, in the presence or absence of added base, such as a dialkylaniline, in the presence or absence of solvent, if desired in a pressure vessel, at temperatures between 0 and 220°C (preferably 60-200°C). It is known to the person skilled in the art how to convert chloro derivatives by nucleophilic substitution, for example using an alkali metal iodide in an inert solvent into the corresponding iodides, or using gaseous

- 48 -

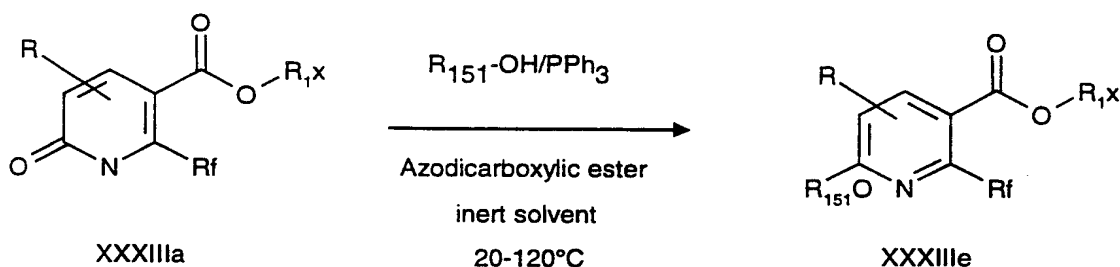
hydrobromic acid in lower carboxylic acids, for example conc. acetic acid, into the corresponding bromo derivatives (for example according to US-A-3,974,166) or using alkali metal fluoride in a dipolar solvent, such as sulfolane, into the corresponding fluoro derivatives.

The compound of the formula XXXIIIc can be prepared by reacting a halo derivative of the formula XXXIIId obtained as described above with an alcohol of the formula $R_{151}\text{-OH}$ in the presence of a base, such as sodium hydride, or an alkali metal oxide or carbonate, or directly with an alkali metal alkoxide, in an inert solvent such as dimethylformamide or in an excess of the alcohol of the formula $R_{151}\text{-OH}$ which corresponds to the group to be introduced, at temperatures between -5 and 160°C , or by reacting, to prepare a corresponding 6-thioether of the formula XXXIIIc, analogously to what was described above, either the halide of the formula XXXIIId with a thiol of the formula $R_{151}\text{-SH}$ in the presence of a base such as sodium hydride or with an alkali metal salt of a thiol in an inert solvent at -10 - 150°C , or by preparing, starting from a pyridone XXXIIIa and using a thionating agent, for example Lawesson's reagent, in an inert solvent, such as toluene or acetonitrile, a pyrithione of the formula XXXIIIb and alkylating this with an alkylating agent $R_{151}\text{-X}$, where X is a leaving group, such as halide (Cl, Br, I) or ROSO_3^- or RSO_2^- , at 20 - 120°C in an inert solvent, such as tetrahydrofuran, to give the thioether of the formula XXXIIIc, or, to prepare the corresponding sulfinyl or sulfonyl derivative of the formula XXXIIIe, reacting with an oxidizing agent, such as m-chloroperbenzoic acid or sodium periodate, or sodium perborate, under temperature control known to the person skilled in the art, depending on the degree of oxidation (for example -30°C - $+50^\circ\text{C}$ for $m_{01}=1$ or -20°C - $+100^\circ\text{C}$ for $m_{01}=2$) in an inert solvent, such as dichloromethane, to give XXXIIIe, or, to prepare 6-alkyl derivatives XXXIIIg according to the invention, reacting a sulfone of the formula XXXIIIe ($m_{01}=2$) or a halo derivative of the formula XXXIIId in the presence or absence of a Pd(0) catalyst such as $\text{Pd(PPh}_3)_2\text{Cl}_2$ with a tetra- $\text{C}_1\text{-C}_6$ alkyltin or with a Grignard reagent $\text{C}_1\text{-C}_6\text{alkyl-MgHal}$ at temperatures between -10° and 180°C , for example analogously to Synlett 1998 (1185), or as described in Organocopper Reagents, R.J.K.Taylor, Oxford University Press 1994, or in Transition Metals in Organic Synthesis, S. Gibson, Oxford Univ. Press, 1997, or in Org. React. 50, 1 (Stille reaction), or, to prepare 6-cyano derivatives of the formula XXXIIIh, reacting a halide of the formula XXXIIId or a sulfone of the formula XXXIIIe ($m_{01}=2$) with an alkali metal or tetraalkylammonium cyanide or

copper cyanide in an inert solvent, such as dichloromethane, tetrahydrofuran or dimethylformamide, at temperatures between 0°C and 220°C.

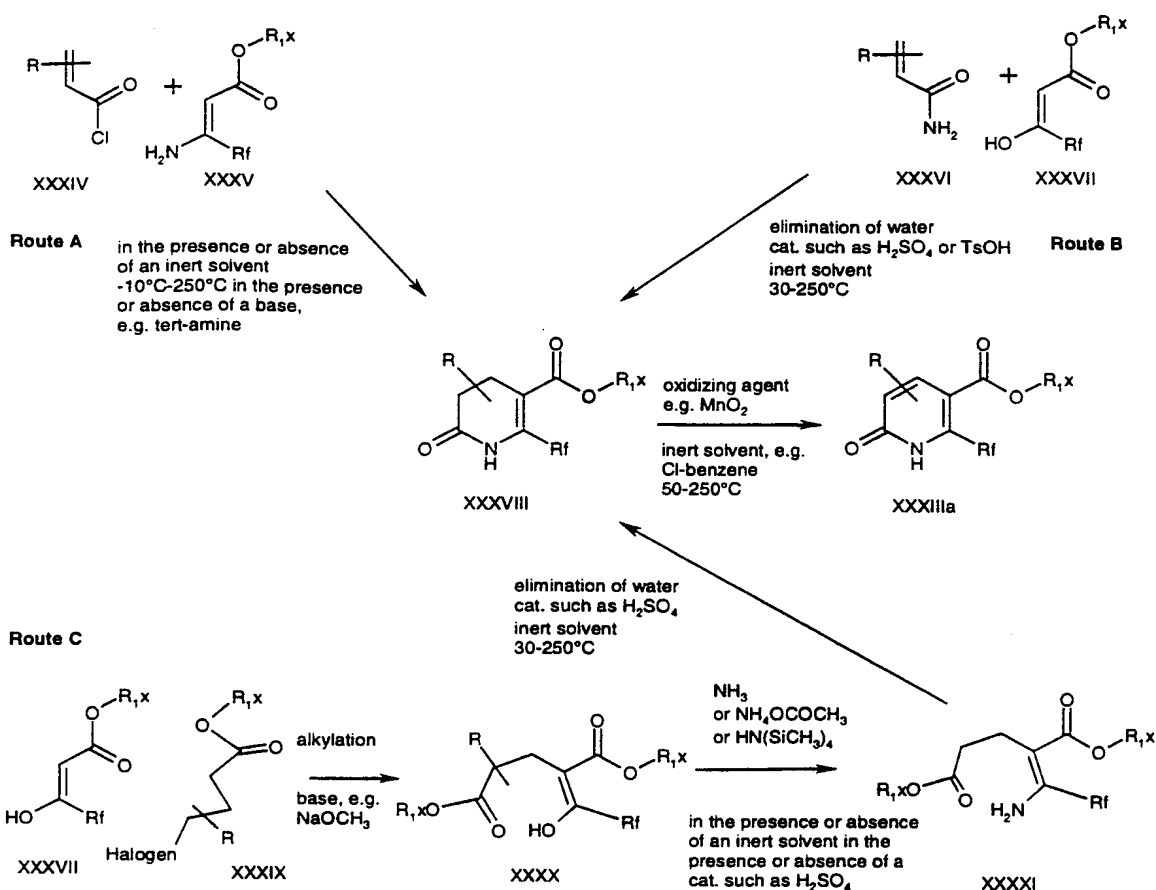
Some of the compounds of the formula XXXIIIe are also obtainable from the pyridone of the formula XXXIIIa by reacting them analogously to Org. React. 42, 2 with an alcohol $R_{151}OH$ in the presence of an azodicarboxylic ester (for example diethyl ester) and triphenylphosphine in an inert solvent, such as tetrahydrofuran or dioxane. (Scheme 9)

Reaction scheme 9:



The intermediates of the formula XXXIIIa required in reaction scheme 8 as starting materials are obtainable according to Scheme 10 route A or route B (Org. Process Research & Development, 1, 370 (1997)) or route C.

- 50 -



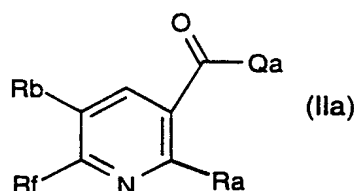
Reaction scheme 10

Intermediates of the formula XXXIIIa are obtainable by route A by reacting, to prepare the 3,4-dihydro-5-alkoxycarbonyl-6-haloalkylpyridin-2-ones of the formula XXXVIII, an enamine of the formula XXXV in the presence or, preferably, in the absence of a solvent either in an excess of enamine or in the presence of a base, such as a tert-amine, with an acryloyl chloride of the formula XXXIV at temperatures between -10° and + 200°C, or by reacting a keto ester of the formula XXXVII with an acrylamide of the formula XXXVI in the presence of a catalyst such as p-toluenesulfonic acid (=HOTs) in an inert solvent, such as toluene, at temperatures between 30 and 200°C, with removal of the water of reaction formed (for example azeotropic distillation), or by reacting a keto ester of the formula XXXVII in the presence of a base, such as an alkali metal alkoxide or magnesium alkoxide, with a 4-halo-keto ester of the formula XXXIX in an inert solvent, such as ethanol, at 0-180°C to give the intermediate of the formula XXXX, converting this with ammonia or an ammonium salt, such

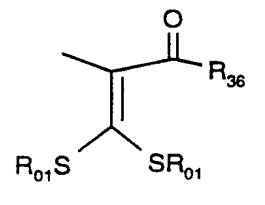
- 51 -

as ammonium acetate, or with a bis-silylamine such as hexamethyldisilazane, in the presence or absence of an acidic catalyst, such as sulfuric acid or p-toluenesulfonic acid or an organic carboxylic acid (for example conc. acetic acid), in an inert solvent and at temperatures between 0° and 180°C into the corresponding enamine of the formula XXXXI, subsequently cyclizing in the presence of a catalyst, such as p-toluenesulfonic acid or sulfuric acid, if desired with continuous removal of the water of reaction formed in an inert solvent, such as toluene, to give the dihydropyridone of the formula XXXVIII, and finally treating with an oxidizing agent, such as manganese dioxide, in an inert solvent, such as chlorobenzene, at temperatures between 50 and 250°C, to prepare the pyridones XXXIIIa.

The intermediates of the formula IIa



in which Q_a is hydroxyl, halogen, cyano, or a group -CH₂(CO)R₃₆ or



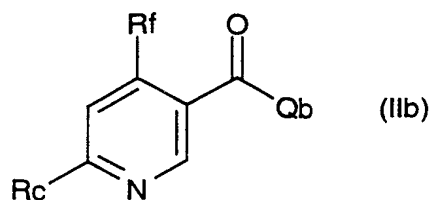
R_b is hydrogen, C₁-C₄alkyl or halogen;

R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl, heptafluoro-n-propyl or trichloromethyl;

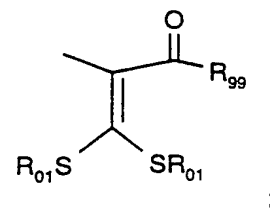
R_a is C₁-C₃alkyl, C₁-C₃haloalkyl, C₃-C₄cycloalkyl, C₁-C₂alkoxy-C₁-C₄alkyl, C₁-C₂-alkylthiomethyl, hydroxyl, halogen, cyano, C₁-C₃alkoxy, C₁-C₃haloalkoxy, allyloxy, propargyloxy, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or C₁-C₃alkylsulfonyloxy, and R₀₁ and R₃₆ are as defined under group Q₅ of the formula I, except for the compounds 2,6-bistrifluoromethylnicotinic acid, 2,6-bistrifluoromethyl-5-methoxynicotinic acid and 2-hydroxy-6-trifluoromethylnicotinic acid, are novel and therefore likewise form part of the subject matter of the present invention.

- 52 -

Compounds of the formula IIb



in which Q_b is hydroxyl, halogen, cyano or a group -CH₂(CO)R₉₉ or

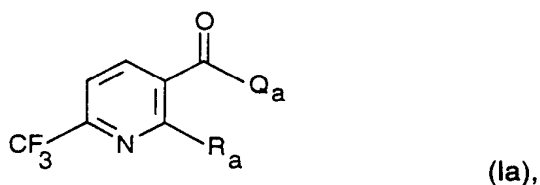


R₉₉ is C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₄cycloalkyl or C₁-C₄alkoxy;

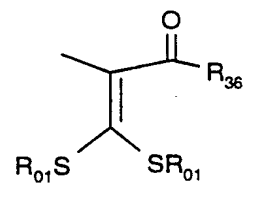
R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl or heptafluoro-*n*-propyl; and

R_c is C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₂alkoxymethyl, C₁-C₂alkylthiomethyl, hydroxyl, halogen, cyano, C₁-C₃alkoxy, C₁-C₃haloalkoxy, allyloxy, propargyloxy, C₁-C₃alkylthio, C₁-C₃-alkylsulfinyl, C₁-C₃alkylsulfonyl or C₁-C₃alkylsulfonyloxy and R₀₁ is as defined under formula I are novel and therefore likewise form part of the subject matter of the present invention.

Preferred compounds of the formula IIa correspond to the formula Ia



in which Q_a is hydroxyl, halogen, cyano or a group -CH₂(CO)R₃₆ or



R₀₁ and R₃₆ are as defined in claim 1 and R_a is C₁-C₃alkyl.

- 53 -

The compounds of the formula I or compositions comprising them can be used according to the invention in all the application methods customary in agriculture, for example pre-emergence application, postemergence application and seed dressing, and various methods and techniques, for example controlled release of active compounds. To this end, the active compound is absorbed in solution onto mineral granule carriers or polymerized granules (urea/formaldehyde) and dried. If appropriate, a coating which allows the active compound to be released in metered form over a certain period of time can additionally be applied (coated granules).

The compounds of the formula I can be employed as herbicides in unchanged form, i.e. as they are obtained in the synthesis, but they are preferably processed in a customary manner with the auxiliaries conventionally used in the art of formulation, for example to give emulsifiable concentrates, directly sprayable or dilutable solutions, dilute emulsions, wettable powders, soluble powders, dusts, granules or microcapsules. Such formulations are described, for example, in WO 97/34485 on pages 9 to 13. The methods of application, such as spraying, atomizing, dusting, wetting, scattering or watering, in the same way as the nature of the compositions, are chosen according to the aims striven for and the given circumstances.

The formulations, i.e. the compositions, formulations or preparations comprising the active compound of the formula I or at least one active compound of the formula I and as a rule one or more solid or liquid formulation auxiliaries, are prepared in a known manner, for example by intimate mixing and/or grinding of the active compounds with the formulation auxiliaries, for example solvents or solid carriers. Surface-active compounds (surfactants) can furthermore additionally be used during the preparation of the formulations. Examples of solvents and solid carriers are given, for example, in WO 97/34485 on page 6.

Depending on the nature of the active compound of the formula I to be formulated, suitable surface-active compounds are nonionic, cationic and/or anionic surfactants and surfactant mixtures having good emulsifying, dispersing and wetting properties.

Examples of suitable anionic, nonionic and cationic surfactants are listed, for example, in WO 97/34485 on pages 7 and 8.

The surfactants conventionally used in the art of formulation and which are suitable to prepare the herbicidal compositions according to the invention are described, inter alia, in "Mc Cutcheon's Detergents and Emulsifiers Annual", MC Publishing Corp., Ridgewood New Jersey, 1981, Stache, H., "Tensid-Taschenbuch" [Surfactant handbook], Carl Hanser Verlag, Munich/Vienna, 1981 and M. and J. Ash, "Encyclopedia of Surfactants", Vol I-III, Chemical Publishing Co., New York, 1980-81.

The herbicidal formulations as a rule comprise 0.1 to 99% by weight, in particular 0.1 to 95% by weight, of herbicide, 1 to 99.9% by weight, in particular 5 to 99.8% by weight, of a solid or liquid formulation auxiliary and 0 to 25% by weight, in particular 0.1 to 25% by weight, of a surfactant. While concentrated compositions are rather preferred as commercial goods, the end user as a rule uses dilute compositions. The compositions can also comprise further additives, such as stabilizers, for example epoxidized or non-epoxidized vegetable oils (epoxidized coconut oil, rapeseed oil or soya oil), defoamers, for example silicone oil, preservatives, viscosity regulators, binders, tackifiers and fertilizers or other active compounds.

The active compounds of the formula I are as a rule applied to the plants or their habitat, at application rates of 0.001 to 4 kg/ha, in particular 0.005 to 2 kg/ha. The dosage required for the desired effect can be determined by tests. It depends on the nature of the effect, the development stage of the crop plant and the weed and on the application (location, time, process) and can, as a function of these parameters, vary within wide ranges.

The compounds of the formula I have herbicidal and growth-inhibiting properties, owing to which they can be used in crops of useful plants, in particular in cereals, cotton, soya, sugar beet, sugar cane, plantings, rapeseed, maize and rice, and for the non-selective control of weeds. Crops include those which have been rendered tolerant towards herbicides or herbicide classes by conventional breeding methods or genetical engineering methods. The weeds to be controlled can be both monocotyledonous and dicotyledonous weeds, for example *Stellaria*, *Nasturtium*, *Agrostis*, *Digitaria*, *Avena*, *Setaria*, *Sinapis*, *Lolium*, *Solanum*, *Echinochloa*, *Scirpus*, *Monochoria*, *Sagittaria*, *Bromus*, *Alopecurus*, *Sorghum halepense*, *Rottboellia*, *Cyperus*, *Abutilon*, *Sida*, *Xanthium*, *Amaranthus*, *Chenopodium*, *Ipomoea*, *Chrysanthemum*, *Galium*, *Viola* and *Veronica*.

The examples below illustrate the invention in more detail, without limiting it.

Preparation Examples:

Example H1: Preparation of 2-difluoromethoxy-6-trifluoromethylnicotinic acid:

At 70°C, 25 g (0.106 mol) of (3-(ethoxycarbonyl)-6-trifluoromethyl)pyrid-2-one (Helv. Chim. Acta (1988), 71(3), 596-601) in a mixture of 50 ml of dimethylformamide and 20 ml of water are treated, in the presence of 16 g (0.116 mol) of finely powdered potassium carbonate and with efficient stirring, with a continuous stream of gaseous Freon-22. After 6 hours, a further 16 g of potassium carbonate and 20 ml of dimethyl sulfoxide are added, and the mixture is stirred with continuous introduction of Freon-22 gas at a temperature of 100°C for another 4 hours. The mixture is then treated with water and ice and extracted with diethyl ether. The aqueous phase is adjusted to pH 2 using conc. HCl and extracted with ethyl acetate. Diethyl ether is added to the extract, and some (3-(carboxy)-6-trifluoromethyl)pyrid-2-one crystals which have precipitated out are removed by filtration. The filtrate is filtered through a silica gel column (mobile phase ethyl acetate/hexane 1:1) giving, as a crystalline product, pure 2-difluoromethoxy-6-trifluoromethylnicotinic acid: ¹H NMR (CDCl₃, ppm): 8.60, d, J=9 Hz, 1H; 7.62, d, J=9 Hz, 1H; 7.62, t, J=67 Hz, 1H.

Example H2: Preparation of 4-methyl-6-trifluoromethylnicotinic acid:

In the presence of 5.8 ml of phenyl dichlorophosphate, 7.5 g (0.03 mol) of ((3-ethoxycarbonyl)-4-methyl-6-trifluoromethyl)pyrid-2-one (Helv. Chim. Acta (1988), 71 (3), 596-601) are heated in a pressure vessel at a temperature of 170°C for 3 hours. The cold reaction solution is filtered directly through a short silica gel column (mobile phase: ethyl acetate/hexane 1:9), giving, as an oily product, ethyl 2-chloro-4-methyl-6-trifluoromethylpyridin-3-ylcarboxylate:

¹H NMR (CDCl₃, ppm): 7.49, s, 1H; 4.48, q, 2H; 2.43, s, 3H, 1.43, t, 3H.

3.0 g (16.8 mmol) of the above product and, in 2 portions, a total of 5 g of ammonium formate are added to a suspension of 0.55 g of 10% Pd/C in 20 ml of methanol, and the mixture is stirred at room temperature for 24 hours. The reaction mixture is then filtered through Celite and, after addition of sodium chloride solution, extracted with ethyl acetate. Chromatographic purification (mobile phase 1:9) gives the 4-methyl-6-trifluoromethylpyridin-3-yl ethyl ester as an oil: ¹H NMR (CDCl₃, ppm): 9.11, s, 1H; 7.56, s, 1H, 4.44, q, 2H; 2.72,

- 56 -

s, 3H, 1.42, t, 3H. This is hydrolysed at 40°C in the presence of aqueous potassium hydroxide solution in dioxane. Extraction with ethyl acetate gives, after acidification to pH 2.7, 4-methyl-6-trifluoromethylnicotinic acid as a crystalline product: ¹H NMR (CDCl₃, ppm): 7.49, s, 1H; 4.48, q, 2H; 2.43, s, 3H, 1.43, t, 3H; 9.32, s, 1H, 7.62, s, 1H, 2.79, s, 3H.

Example H3: Preparation of 6-chloro-4-trifluoromethylnicotinic acid:

9.6 g (0.047 mol) of methyl 4-trifluoromethylpyridin-3-ylcarboxylate, dissolved in 50 ml of dichloromethane, are treated with 30% hydrogen peroxide/urea adduct and 17 ml of trifluoroacetic anhydride. The reaction solution is stirred at temperature of 20°C for 20 hours and then washed once each with dilute sodium hydroxide solution and half-saturated sodium chloride solution. The product obtained is 3-methoxycarbonyl-4-trifluoromethyl-3-pyridine N-oxide; ¹H NMR (CDCl₃, ppm): 8.55, s, 1H; 8.31, d, 1H; 7.6, d, 1H; 3.98, s, 3H. 4.85 g (0.022 mol) of the above product are then added to a mixture of 5 ml of phosphorus oxychloride and 4.3 ml of ethyldiisopropylamine in 15 ml of 1,2-dichloroethane, and the mixture is heated to a temperature of 60°C. After about 2 hours, another 2 ml of phosphorus oxychloride and 2.8 ml of ethyldiisopropylamine are added, and the mixture is stirred at this temperature for 20 hours. The reaction mixture is subsequently added to ice-water, adjusted to pH 3 using 30% NaOH and then extracted with dichloromethane. Filtration through a little silica gel gives an approximately 5:1 product mixture of the two 6-chloro- and 2-chloro-4-trifluoromethylpyridin-3-yl methyl esters, which can be separated by HPLC into the pure components. Thus, pure methyl 6-chloro-4-trifluoromethylpyridin-3-ylcarboxylate is obtained as the main product; ¹H NMR (CDCl₃, ppm): 8.91, s, 1H; 7.68, s, 1H; 3.98, s, 3H, and pure methyl 2-chloro-4-trifluoromethylpyridin-3-ylcarboxylate is obtained as the byproduct; ¹H NMR (CDCl₃, ppm): 8.64, d, 1H; 7.52, d, 1H; 4.01, s, 3H. In the presence of 0.073 g of potassium hydroxide, 0.22 g of pure methyl 6-chloro-4-trifluoromethylpyridin-3-ylcarboxylate are hydrolysed at room temperature in a 1:1 mixture of 6 ml of dioxane/water. Recrystallization gives the pure 6-chloro-4-trifluoromethylnicotinic acid: m.p. 115-117°C; ¹H NMR (CDCl₃, ppm): 9.12, s, 1H; 7.24, s, 1H.

Example H4: Preparation of 6-methylthio-4-trifluoromethylnicotinic acid:

In boiling acetone, 0.70 g (2.9 mol) of methyl 6-chloro-4-trifluoromethylpyridin-3-ylcarboxylate is treated in the presence of a catalytic amount of 18-crown-6 with

- 57 -

methanethiolate (0.33 g) until no further conversion can be detected by gas chromatographic analysis. The mixture is then filtered through silica gel and evaporated. This gives 0.73 g of methyl 6-methylthio-4-trifluoromethylpyridin-3-ylcarboxylate; ^1H NMR (CDCl_3 , ppm): 8.98, s, 1H; 7.48, s, 1H; 3.94, s, 3H; 2.64, s, 3H. Hydrolysis under the conditions mentioned above gives 6-methylthio-4-trifluoromethyl-nicotinic acid: ^1H NMR (CDCl_3 , ppm): 9.02, s, 1H; 7.46, s, 1H; 2.64, s, 3H.

Example H5: 6-Hydroxy-2-trifluoromethylpyridin-3-yl ethyl ester:

Under an atmosphere of nitrogen and with stirring, 33.4 g of 3,4-dihydro-5-ethoxycarbonyl-6-trifluoromethylpyridin-2-one (Org. Res.& Devel. 1,370 (1997)) and 34 g of manganese dioxide in 250 ml of 1,2-dichlorobenzene are heated under reflux for 24 hours. In intervals of about 20 hours, manganese dioxide (total amount of MnO_2 used: 213 g) is added six more times over a period of 3 days, and the mixture is in each case heated further under reflux. The mixture is then cooled, diluted with ethyl acetate, and filtered through silica gel, the filtercake is washed with ethyl ester and the filtrate is concentrated. The solid residue (26.7 g, i.e. 80%), which may still contain about 6% of starting material, is directly reacted further. For complete purification, it is possible to purify, for example, over silica gel (hexane/ethyl acetate 7:3) (^1H NMR, CDCl_3 , ppm): 8.02 (d, 1H); 6.85 (d, 1H); 4.86 (q, 2H); 1.37 (t, 1H).

Example H6: Preparation of ethyl 6-chloro-2-trifluoromethylpyridin-3-ylcarboxylate:

In a bomb tube, 23.5 g of ethyl 6-hydroxy-2-trifluoromethylpyridin-3-ylcarboxylate and 23.5 ml of phenyl dichlorophosphate are heated at 170°C for 3 hours, and the mixture is, after cooling, added to ice-water, stirred for a few minutes and subsequently taken up in ethyl acetate and made slightly alkaline using sodium bicarbonate and then washed neutral with water. The extracts are admixed with a little hexane and filtered through silica gel. The filtrate is evaporated, leaving 21.6 g (85%) of the title compound in the form of a dark oil with n_D^{30} 1.4679. ^1H NMR (CDCl_3 , ppm): 8.09 (d, 1H); 7.60 (d, 1H); 4.43 (q, 2H); 1.43 (t, 3H).

Example H7: Preparation of 6-chloro-2-trifluoromethylpyridin-3-ylcarboxylic acid:

2.5 g of the ethyl 6-chloro-2-trifluoromethylpyridin-3-ylcarboxylate obtained above are dissolved in the smallest possible amount of tetrahydrofuran, treated with approximately 20 g of ice and 11 ml of 1N lithium hydroxide and stirred at room temperature until hydrolysed completely. The mixture is then washed with a little ether and the aqueous phase is acidified using 4N hydrochloric acid and extracted with ethyl acetate. The extracts are washed with sodium chloride solution, dried and evaporated. This gives 1.8 g of the title compound of m.p. 154-156°C. The other free carboxylic acids are likewise obtained from their esters in this manner.

Example H8: Preparation of ethyl 6-methylthio-2-trifluoromethylpyridin-3-ylcarboxylate:

Under an atmosphere of nitrogen and with stirring, a solution of 1.7 g of 6-chloro-2-trifluoromethylpyridin-3-yl ethyl ester in 60 ml of dimethylformamide is treated a little at a time with 0.52 g of sodium methanethiolate and stirred at room temperature until the reaction has gone to completion. The reaction mixture is then poured into ice-water, made neutral by addition of a little dilute hydrochloric acid and extracted with ethyl acetate. The extracts are diluted with a little hexane, washed with water, dried over sodium sulfate, filtered and, after filtration through a little silica gel, evaporated. This gives 1.4 g (79%) of the title compound in the form of an oil with n_D^{25} 1.5100, ^1H NMR (CDCl_3 , ppm): 7.90 (d, 1H); 7.40 (d, 1H); 1.40 (q, 2H); 2.60 (s, 3H); 1.49 (t, 3H).

Example H9: Preparation of ethyl 6-ethylthio-2-trifluoromethylpyridin-3-ylcarboxylate:

In an apparatus previously flushed with nitrogen, a solution of 1.8 ml of ethanethiol in 40 ml of dimethylformamide, which had been cooled to 0°C, is treated a little at a time with 0.96 g of sodium hydride oil dispersion (60%), and the mixture is stirred at room temperature. After evolution of hydrogen has ceased, the mixture is cooled to -20°C, and a solution of 5.07 g of 6-chloro-2-trifluoromethylpyridin-3-yl ethyl ester in 10 ml of dimethylformamide is added dropwise at this temperature, and the mixture is stirred slowly until room temperature has been reached. After the reaction has ended (approximately 3 hours), the reaction mixture is added to ice-water and extracted with ethyl acetate. The extracts are washed with water, dried, filtered, evaporated and dried under high vacuum. This gives 5.0 g (89%) of the title

- 59 -

compound as a brownish oil. ^1H NMR (CDCl_3 , ppm): 7.90 (d, 1H); 7.35 (d, 1H); 4.40 (q, 2H); 3.25 (q, 2H); 1.38 (2t, 6H).

Example H10: Preparation of ethyl 6-ethylsulfinyl-2-trifluoromethylpyridin-3-ylcarboxylate:

Under an atmosphere of nitrogen and with stirring and cooling, a solution of 2.5 g of m-chloroperbenzoic acid in 40 ml of methylene chloride is added dropwise at a temperature of -20°C to a solution of 2.8 g of ethyl 6-ethylthio-2-trifluoromethylpyridin-3-ylcarboxylate, which had been charged initially, and the mixture is stirred at a temperature of $+5^\circ\text{C}$ for 20 hours. The mixture is then evaporated gently and purified over silica gel (hexane/ethyl acetate 7:3). This gives 2.48 g (84%) of 6-ethylsulfinyl-2-trifluoromethylpyridin-3-yl-ethyl ester. ^1H NMR (CDCl_3 , ppm): 8.38 (d, 1H); 8.30 (d, 1H); 4.45 (q, 2H); 3.26 – 3.00 (m, 2H); 1.43 (t, 3H); 1.26 (t, 3H).

Ethyl 6-methylsulfinyl-2-trifluoromethylpyridin-3-ylcarboxylate is obtained in an analogous manner.

Example H11: Preparation of ethyl 6-methylsulfonyl-2-trifluoromethylpyridin-3-ylcarboxylate:

Under an atmosphere of nitrogen and with stirring and cooling, 21 g of m-chloroperbenzoic acid are introduced a little at a time over a period of 30 minutes at a temperature of -20°C into a solution of 3.6 g of 6-methylthio-2-trifluoromethylpyridin-3-yl ethyl ester, which had been charged initially, and the reaction mixture is stirred at room temperature for 5 hours. The mixture is then evaporated and filtered through silica gel (ethyl acetate/methanol/triethylamine 85:10:5). This gives 3.95 g (97%) of ethyl 6-methylsulfonyl-2-trifluoromethylpyridin-3-ylcarboxylate as a brownish solid with m.p. $70-72^\circ\text{C}$. ^1H NMR (CDCl_3 , ppm): 8.40 (1H,d); 8.33 (1H,d); 4.47 (2H,q); 1.43 (3H,t).

Example H12: Preparation of ethyl 6-cyano-2-trifluoromethylpyridin-3-ylcarboxylate:

Under an atmosphere of nitrogen and with stirring, a solution of 0.596 g of ethyl 6-methylsulfonyl-2-trifluoromethylpyridin-3-ylcarboxylate in 5 ml of dimethylformamide is treated with 160 mg of solid potassium cyanide and a spatula tipful of 18-crown-6, and the mixture is heated at 80°C for 3 hours. The mixture is cooled overnight, and the next day

- 60 -

another 30 mg of potassium cyanide are added and the mixture is heated further until the starting material has disappeared (approximately 2 hours). The mixture is then cooled, added to ice-water and extracted with ethyl acetate. The extracts are washed with water, dried, evaporated and freed from traces of dimethylformamide under high vacuum at approximately 40°C. This gives 480 mg (yield virtually quantitative) of ethyl 6-cyano-2-trifluoromethylpyridin-3-ylcarboxylate in the form of an oil which slowly solidifies. ¹H NMR (CDCl₃, ppm): 8.29 (1H,d); 7.97 (1H,d); 4.48 (2H, d); 1.43 (3H,t).

Example H13: Preparation of ethyl 6-methyl-2-trifluoromethylpyridin-3-ylcarboxylate:

Under an atmosphere of nitrogen and with stirring, a solution of 3.6 g of 6-chloro-2-trifluoromethylpyridin-3-yl ethyl ester in 20 ml of dimethylacetamide is treated with 4.5 ml of tetramethyltin and 200 mg of dichloro(bis(triphenylphosphine)palladium), and the mixture is heated to a temperature of 80-90°C for 24 hours. Then another 1.5 ml of tetramethyltin and 30 mg of dichloro(bis(triphenylphosphine)palladium) are added and the mixture is heated for another 6 hours. The reaction mixture is then freed from excess tetramethyltin using reduced pressure (destruction by passing through ethanolic sodium hydroxide solution), cooled and added to ice-water. The mixture is extracted with diethyl ether and the extract is washed with water, dried over sodium sulfate, filtered through a little silica gel, evaporated and dried under reduced pressure. This gives the title compound (2.4 g, 73%), which still contains traces of dimethylacetamide, in the form of a dark oil.

¹H NMR (CDCl₃, ppm): 8.00 (1H,d); 7.42 (1H,d); 4.42 (2H, d); 2.68 (3H, s); 1.41 (3H,t).

Hydrolysis analogously to the description already mentioned above affords 6-methyl-2-trifluoromethylpyridin-3-ylcarboxylic acid (brown resin) which is directly converted further into the carbonyl chloride.

Example H14: Preparation of 6-methyl-2-trifluoromethylpyridin-3-ylcarbonyl chloride:

A solution of 0.45 g of 6-methyl-2-trifluoromethylpyridin-3-ylcarboxylic acid in 20 ml of dichloromethane is charged initially, 3 drops of dimethylformamide are added and the mixture is subsequently treated with 1.6 ml of oxalyl chloride. After the intensive evolution of gas has ceased, the mixture is kept at a bath temperature of 40°C for another 1.5 hours and then evaporated. The crude product (0.56 g) that remains as residue can be directly reacted further. ¹H NMR (CDCl₃, ppm): 8.20 (1H,d); 7.51 (1H,d); 2.65 (3H, s).

Example H15: Preparation of 4-oxobicyclo[3.2.1]oct-2-en-2-yl 6-methyl-2-trifluoromethyl-nicotinate:

Under an atmosphere of nitrogen and with stirring and cooling, a solution of 0.56 g of 6-methyl-2-trifluoromethylpyridin-3-ylcarbonyl chloride in 10 ml of methylene chloride is added dropwise at 0°C to a solution of 0.4 g of bicyclo[3.2.1]octane-2,4-dione and 0.72 g of triethylamine in 10 ml of methylene chloride, and the mixture is stirred for 5 hours until room temperature has been reached. The mixture is then diluted with methylene chloride, washed with cold 1N hydrochloric acid, dried and evaporated to give the desired enol ester (0.8 g) as a brown resin which is directly reacted further. ¹H NMR (CDCl₃, ppm): 8.17 (1H, d); 7.51 (1H, d); 5.96 (1H, s); 3.04 (2H, m); 2.75 (3H, s); 2.32-1.30 (m).

Example H16: Preparation of 4-hydroxy-3-(6-methyl-2-trifluoromethylpyridin-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one:

Under an atmosphere of nitrogen and with stirring, 0.8 g of the above enol ester is dissolved in 30 ml of acetonitrile at 25 °C, and the mixture is treated with 0.5 ml of triethylamine and 0.4 ml of acetone cyanohydrin and stirred at room temperature for 20 hours. The mixture is then diluted with solvent and washed with dilute hydrochloric acid, dried and evaporated, and the residue is purified through a little silica gel (ethyl acetate/methanol/triethylamine 85:10:5). This gives 371 mg (46%) of the title compound (triethylamine salt) in the form of a yellowish resin. ¹H NMR (CDCl₃, ppm): 7.45 (1H, d); 7.25 (1H, d); 3.80-3.43 (4H, m); 3.18 (6H, m); 2.80 (2H, s(br)); 2.62 (3H, s); 2.20-1.54 (m).

Example H17: Preparation of ethyl 6-methoxy-2-trifluoromethylpyridin-3-ylcarboxylate:

A suspension of 5.65 g of ethyl 6-hydroxy-2-trifluoromethylpyridin-3-ylcarboxylate, 6.0 g of potassium carbonate and 2.7 ml of methyl iodide is, together with a spatula tipful of 18-crown-6, heated to a temperature of 60-70°C until the reaction has gone to completion. The mixture is then filtered, the filtration residue is washed with acetonitrile and the filtrate is concentrated under reduced pressure. The residue is cooled, admixed with ice-water, neutralized with dilute sulfuric acid and extracted with ethyl acetate. The extracts are washed with water, dried, diluted with a little hexane and filtered through a little silica gel.

- 62 -

The resulting residue is the title compound (3.7 g, 65%) in the form of slightly orange crystals of m.p. 150-152°C.

¹H NMR (CDCl₃, ppm): 8.00 (1H, d); 6.83 (1H, d); 4.38 (2H, q); 4.01 (3H, s); 1.39 (3H, t).

Example H18: Preparation of 4-hydroxy-3-(2-methyl-6-trifluoromethylpyridin-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one:

6.68 g (0.0305 mol) of methyl 2-methyl-6-trifluoromethylnicotinate (prepared as described in Heterocycles, 46, 129 (1997)) are dissolved in 250 ml of methanol/water (3:1 mixture), and 1.92 g (0.046 mol) of lithium hydroxide hydrate are added a little at a time at 22°C. After 4 hours at 22°C, the reaction mixture is poured into ethyl acetate and 2 N hydrochloric acid, the organic phase is washed three times with water, dried with sodium sulfate and evaporated and the residue is triturated with a little hexane. Filtration gives 5.69 g (90% of theory) of the expected 2-methyl-6-trifluoromethylnicotinic acid of m.p. 147-149°C.

The 2-methyl-6-trifluoromethylnicotinic acid obtained (2.0 g, 0.0098 mol) is dissolved in 20 ml of oxalyl chloride. Three drops of dimethylformamide are added, and the mixture is heated under reflux for 1 hour. The mixture is then concentrated using a rotary evaporator, and the residue (2-methyl-6-trifluoromethylnicotinoyl chloride) is taken up in 30 ml of methylene chloride. At 0°C, 2.7 ml (0.0196 mol) of triethylamine and 0.12 g (0.00098 mol) of dimethylaminopyridine are added. 1.49 g (0.0108 mol) of bicyclo[3.2.1]octane-2,4-dione, dissolved in 20 ml of methylene chloride, are then added dropwise. After 3 hours at 22°C, the reaction mixture is extracted with 2 N hydrochloric acid. The methylene chloride phase is separated off, washed with water and subsequently extracted with 10% aqueous sodium bicarbonate solution, dried over sodium sulfate and evaporated. This gives 3.18 g (100% of theory) of 4-oxobicyclo[3.2.1]oct-2-en-2-yl 2-methyl-6-trifluoromethylnicotinate as an oil, which can be processed further without purification.

3.02 g (0.0093 mol) of 4-oxobicyclo[3.2.1]oct-2-en-2-yl 2-methyl-6-trifluoromethylnicotinate and 1.9 ml (0.0136 mol) of triethylamine are dissolved in 45 ml of acetonitrile. At 22°C, 0.01 ml of acetone cyanohydrin are added. After 18 hours at 22°C, the reaction mixture is poured into dilute hydrochloric acid and extracted with ethyl acetate. The ethyl acetate phase is washed with water and then with brine, dried over sodium sulfate and evaporated, and the residue is dissolved in a little warm acetone. The product crystallizes on standing. Filtration gives 0.99 g (33% of theory) of the expected 4-hydroxy-3-(2-methyl-6-

trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one as white crystals (m.p. 75-77°C).

Example H19: Preparation of 3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-4-oxo-bicyclo[3.2.1]oct-2-en-2-yl benzoate:

At 0°C, a solution of 0.562 g (0.0004 mol) of benzoyl chloride in 1 ml of tetrahydrofuran is added to a solution of 1.14 g (0.0035 mol) of 4-hydroxy-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one and 0.517 g (0.004 mol) of ethyldiisopropylamine in 15 ml of tetrahydrofuran. The reaction mixture is stirred at 25°C for 2 hours, evaporated and purified over silica gel (hexane/ethyl acetate 1:1). This gives 0.9 g (60%) of the title compound in the form of a yellowish resin. ¹H NMR (CDCl₃, ppm): 7.91-7.87, m, 3H; 7.64, t, J=7.5 Hz, 1H; 7.50-7.40, m, 3H; 3.24, br t, J=4 Hz, 1H; 3.14, br t, J=4 Hz, 1H; 2.70, s, 3H; 2.47, d, J=13.5 Hz, 1H; 2.40, 2.15, m, 3H; 1.95-1.8, m, 2H.

Example H20: Preparation of 4-hydroxy-3-(2-methyl-1-oxy-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one:

16.25 g (0.05 mol) of 4-hydroxy-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one and 9.4 g (0.1 mol) of urea/hydrogen peroxide complex are dissolved in 150 ml of methylene chloride, and 20.5 ml (0.15 mol) of trifluoroacetic anhydride are added dropwise at 25°C. After 14 hours at 25°C, the reaction mixture is added to ethyl acetate and water, and the organic phase is washed twice with water, dried with sodium sulfate and evaporated. The residue is chromatographed over silica gel (mobile phase: ethyl acetate/methanol 9/1). This gives 6.8 g (40%) of the desired product as white crystals (m.p. 109-110°C).

Example H21: Preparation of 4-chloro-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one:

20.15 g (0.062 mol) of 4-hydroxy-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one are suspended in 50 ml of oxalyl chloride, and 0.1 ml of dimethylformamide are added dropwise. After the intensive evolution of gas has ceased, the mixture is kept at a bath temperature of 45°C for another 1.5 hours and then

evaporated, and the residue is suspended in a little ethyl acetate and admixed with stirring at 0°C with hexane. Filtration gives 19.19 g (90% of theory) of 4-chloro-3-(2-methyl-6-trifluoromethyl-pyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one of m.p. 137-138°C.

Example H22: Preparation of 4-amino-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one:

1.0 g (0.0029 mol) of 4-chloro-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one are dissolved in 10 ml of tetrahydrofuran and, at 25°C, treated with 2.0 ml of aqueous ammonia (30%). After 0.5 hours at 25°C, the reaction mixture is added to ethyl acetate and water, the organic phase is washed twice with water, dried with sodium sulfate and evaporated and the residue is triturated with a little ethyl acetate. Filtration gives 0.81 g (86% of theory) of 4-amino-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one in the form of white crystals (m.p. 262-263°C). ¹H NMR (CDCl₃, ppm): 10.62 br s 1H; 8.223 br s 1H; 7.41, d, J= 8.1 Hz, 1H; 7.35, d, J= 8.1 Hz, 1H; 3.03, br t, J= 4.8 Hz, 1H; 2.70, br t, J= 4.8 Hz, 1H; 2.41, s, 3H; 1.97-2.14, m, 3H; 1.77-1.812, m, 1H; 1.47-1.70, m, 2H.

Example H23: Preparation of 4-(4-chlorophenylsulfanyl)-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one:

2.0 g (0.0058 mol) of 4-chloro-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)-bicyclo[3.2.1]oct-3-en-2-one, 0.07 g of dimethylaminopyridine (0.00058 mol) and 1.61 ml of triethylamine are dissolved in 15 ml of methylene chloride. At 25°C, 0.092 g (0.0064 mol) of 4-chlorothiophenol are added. After 2 hours at 22°C, the reaction mixture is evaporated and purified over silica gel (hexane/ethyl acetate 2:1). Recrystallization (hexane/acetic acid at -25°C) gives pure 4-(4-chlorophenylsulfanyl)-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one: m.p. 130-131°C.

Example H24: Preparation of 4-(4-chlorobenzenesulfonyl)-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one:

0.6 g (0.00133 mol) of the 4-(4-chlorophenylsulfanyl)-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one obtained above is dissolved in methylene chloride,

- 65 -

and 0.9 ml of peracetic acid (39% in acetic acid, 0.0053 mol) are added dropwise at 25°C. After 5 hours at 25°C, the reaction mixture is added to ethyl acetate and water, the organic phase is washed with water, dried with sodium sulfate and evaporated and the residue is triturated with a little hexane. Filtration gives 0.56 g (84% of theory) of 4-(4-chlorobenzenesulfonyl)-3-(2-methyl-6-trifluoromethylpyridine-3-carbonyl)bicyclo[3.2.1]oct-3-en-2-one in the form of white crystals (m.p.166-167°C).

Example H25: Preparation of (5-cyclopropyl-3-methylsulfanylisoxazol-4-yl)-(2-methyl-6-trifluoromethylpyridin-3-yl)methanone and cyclopropyl-[3-methylsulfanyl-5-(2-methyl-6-trifluoromethylpyridin-3-yl)isoxazol-4-yl]methanone:

14.8 g (0.080 mol) of tert-butyl 3-cyclopropyl-3-oxopropionic acid ester are dissolved in 25 ml of MeOH, and 1.93 g (0.080 mol) of magnesium are added. With ice-bath cooling, 7 ml of carbon tetrachloride are added dropwise, and the reaction mixture is stirred at a temperature of 22°C for one hour. After evaporation, the residue is suspended in 100 ml of acetonitrile, and 16.31 g (0.073 mol) of 2-methyl-6-trifluoromethylnicotinoyl chloride (prepared as described in Example H18), dissolved in 50 ml of acetonitrile, are added dropwise at a temperature of 22°C. After 6 hours, the reaction mixture is taken up in ethyl acetate and washed with saturated sodium bicarbonate solution. The ethyl acetate phase is separated off, washed with water, dried over sodium sulfate and evaporated. The residue is dissolved in 160 ml of methylene chloride, and 10 ml of trifluoroacetic acid are added dropwise at a temperature of 22°C. After 18 hours, the reaction mixture is poured into water and extracted with methylene chloride. The methylene chloride phase is washed with water and then with saturated aqueous sodium chloride solution, dried over sodium sulfate and evaporated. This gives 17.3 g (88% of theory) of 1-cyclopropyl-3-(2-methyl-6-trifluoromethylpyridin-3-yl)propane-1,3-dione as an oil, which is processed further without purification. The 1-cyclopropyl-3-(2-methyl-6-trifluoromethylpyridin-3-yl)propane-1,3-dione obtained above (15.0 g, 0.055 mol) is dissolved in 150 ml of dimethylformamide, and 50 g of potassium fluoride on an aluminium oxide support (alumina) (0.0055 mol/g, 0.276 mol) are added a little at a time at a temperature of 0°C. After 5 minutes, 6.7 g (0.088 mol) of carbon disulfide are added dropwise. After 2 hours, 23.6 g (0.166 mol) of methyl iodide are added dropwise, and the reaction mixture is warmed to a temperature of 22°C. After a further 2 hours, the alumina is filtered off, the filtrate is added to water and the mixture is extracted with ethyl acetate. The ethyl acetate phase is washed with water and then with

- 66 -

saturated aqueous sodium chloride solution, dried over sodium sulfate and evaporated. The residue is chromatographed over silica gel (mobile phase: ethyl acetate/hexane 15/1). This gives 12.0 g (60% of theory) of 2-(bismethylsulfanylmethylene)-1-cyclopropyl-3-(2-methyl-6-trifluoromethylpyridin-3-yl)-propane-1,3-dione as a solid.

12.0 g (0.033 mol) of the product obtained above are, together with 5.4 g (0.066 mol) of anhydrous sodium acetate, suspended in 120 ml of ethanol. 4.6 g (0.066 mol) of hydroxylamine hydrochloride are added, and the reaction mixture is kept at a temperature of 22°C for 5 hours. Another 2.7 g of anhydrous sodium acetate and 2.3 g of hydroxylamine hydrochloride are then added. After 18 hours, the reaction mixture is diluted with water and extracted with ethyl acetate. The ethyl acetate phase is washed with water and then with saturated aqueous sodium chloride solution, dried over sodium sulfate and evaporated. Trituration with a little ethyl acetate gives 9.0 g (79.5%) of the desired product as a 2:1 isomer mixture in the form of white crystals (m.p. 103-104°C).

Main isomer: ^1H NMR (CDCl_3 , ppm) ((5-cyclopropyl-3-methylsulfanylisoxazol-4-yl)-(2-methyl-6-trifluoromethylpyridin-3-yl)methanone) 7.98, d, $J=7.8$ Hz, 1H; 7.61, d, $J=7.8$ Hz, 1H; 2.67, s, 3H; 2.50, s, 3H; 2.02-1.93, m, 1H; 1.34-1.28, m, 2H; 1.18-1.09, m, 2H.

^1H NMR (CDCl_3 , ppm) (cyclopropyl-[3-methylsulfanyl-5-(2-methyl-6-trifluoromethylpyridin-3-yl)isoxazol-4-yl]methane): 7.95, d, $J=7.8$ Hz, 1H; 7.69, d, $J=7.8$ Hz, 1H; 2.67, s, 3H; 2.66, s, 3H; 1.74-1.64, m, 1H; 1.28-1.18, m, 2H; 0.89-0.80, m, 2H.

Example H26: Preparation of (5-cyclopropyl-3-methylsulfinylisoxazol-4-yl)-(2-methyl-6-trifluoromethylpyridin-3-yl)methanone and cyclopropyl-[3-methanesulfinyl-5-(2-methyl-6-trifluoromethylpyridin-3-yl)isoxazol-4-yl]methanone:

1.50 g (0.0043 mol) of the isomer mixture obtained above are dissolved in 30 ml of acetone/water (2:1 mixture), and 1.02 g (0.0048 mol) of sodium metaperiodate are added a little at a time at 22°C. After 5 hours, the reaction mixture is evaporated using a rotary evaporator. The residue is taken up in water and ethyl acetate. The ethyl acetate phase is dried over sodium sulfate and evaporated. The residue is chromatographed over silica gel (mobile phase: ethyl acetate/hexane 3/1). This gives initially 0.8 g (51% of theory) of (5-cyclopropyl-3-methylsulfinylisoxazol-4-yl)-(2-methyl-6-trifluoromethylpyridin-3-yl)methanone as white crystals (m.p. 96-97°C). ^1H NMR (CDCl_3 , ppm): 7.86, d, $J=7.8$ Hz, 1H; 7.59, d,

- 67 -

$J=7.8$ Hz, 1H; 3.078, s, 3H; 2.66, s, 3H; 1.54-1.49, m, 1H; 1.32-1.25, m, 2H; 1.13-1.072, m, 2H.

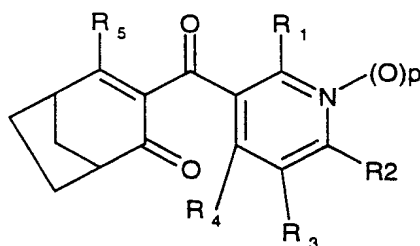
The second product that elutes consists of 0.34 g (22% of theory) of cyclopropyl-[3-methanesulfinyl-5-(2-methyl-6-trifluoromethylpyridin-3-yl)isoxazol-4-yl]methanone as white crystals (m.p. 112-113°C). ^1H NMR (CDCl_3 , ppm): 7.97, d, $J=7.8$ Hz, 1H; 7.67, d, $J=7.8$ Hz, 1H; 3.128, s, 3H; 2.62, s, 3H; 1.69-1.64, m, 1H; 1.26-1.18, m, 2H; 0.90-0.85, m, 2H.

Example H27: Preparation of (5-cyclopropyl-3-methanesulfonylisoxazol-4-yl)-(2-isopropyl-6-trifluoromethylpyridin-3-yl)methanone:

0.15 g (0.0045 mol) of (5-cyclopropyl-3-methylsulfonylisoxazol-4-yl)-(2-isopropyl-6-trifluoromethylpyridin-3-yl)methanone is dissolved in methylene chloride, and 0.28 ml of peracetic acid (39% in acetic acid, 0.0016 mol) are added dropwise at a temperature of 5°C. After 15 hours at 25°C, the reaction mixture is added to ethyl acetate and water, and the organic phase is washed with water, dried with sodium sulfate and evaporated. The residue is chromatographed over silica gel (mobile phase: ethyl acetate/hexane 5/1). This gives 0.121 g (74% of theory) of the expected product as white crystals (m.p. 105-106°C).

In an analogous manner, and according to the methods shown in the general reaction schemes 1-10 and in the references mentioned therein, it is also possible to prepare the compounds listed in the tables below. In these tables, CCH is the ethynyl group, Ph is the phenyl group and Me is the methyl group.

Table 1:



Comp.	R_1	R_2	R_3	R_4	R_5	p
No.						

- 68 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.001	H	CF ₃	H	H	OH	0
1.002	F	CF ₃	H	H	OH	0
1.003	Cl	CF ₃	H	H	OH	0
1.004	Br	CF ₃	H	H	OH	0
1.005	CHF ₂	CF ₃	H	H	OH	0
1.006	CCl ₃	CF ₃	H	H	OH	0
1.007	CClF ₂	CF ₃	H	H	OH	0
1.008	CF ₃	CF ₃	H	H	OH	0
1.009	CH ₃	CF ₃	H	H	OH	0
1.01	CH ₂ CH ₃	CF ₃	H	H	OH	0
1.011	CH(CH ₃) ₂	CF ₃	H	H	OH	0
1.012	(CH ₂) ₂ CH ₃	CF ₃	H	H	OH	0
1.013	C(CH ₃) ₃	CF ₃	H	H	OH	0
1.014	Ph	CF ₃	H	H	OH	0
1.015	CH ₂ F	CF ₃	H	H	OH	0
1.016	CH ₂ Cl	CF ₃	H	H	OH	0
1.017	CH ₂ Br	CF ₃	H	H	OH	0
1.018	CH ₂ OH	CF ₃	H	H	OH	0
1.019	CH ₂ OCOCH ₃	CF ₃	H	H	OH	0
1.02	CH ₂ OCOPh	CF ₃	H	H	OH	0
1.021	CH ₂ OCH ₃	CF ₃	H	H	OH	0
1.022	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	OH	0
1.023	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	OH	0
1.024	CH ₂ SMe	CF ₃	H	H	OH	0
1.025	CH ₂ SOMe	CF ₃	H	H	OH	0
1.026	CH ₂ SO ₂ Me	CF ₃	H	H	OH	0
1.027	CH ₂ SO ₂ Ph	CF ₃	H	H	OH	0
1.028	SCH ₂ Ph	CF ₃	H	H	OH	0
1.029	SOCH ₂ Ph	CF ₃	H	H	OH	0
1.03	SO ₂ CH ₂ Ph	CF ₃	H	H	OH	0
1.031	SCH ₃	CF ₃	H	H	OH	0

- 69 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.032	SOCH ₃	CF ₃	H	H	OH	0
1.033	SO ₂ CH ₃	CF ₃	H	H	OH	0
1.034	SPh	CF ₃	H	H	OH	0
1.035	SOPh	CF ₃	H	H	OH	0
1.036	SO ₂ Ph	CF ₃	H	H	OH	0
1.037	N(CH ₃) ₂	CF ₃	H	H	OH	0
1.038	CH=CH ₂	CF ₃	H	H	OH	0
1.039	CH ₂ CH=CH ₂	CF ₃	H	H	OH	0
1.04	SO ₂ N(CH ₃) ₂	CF ₃	H	H	OH	0
1.041	ethynyl	CF ₃	H	H	OH	0
1.042	cyclopropyl	CF ₃	H	H	OH	0
1.043	OCH ₃	CF ₃	H	H	OH	0
1.044	OPh	CF ₃	H	H	OH	0
1.045	OCHF ₂	CF ₃	H	H	OH	0
1.046	CO ₂ Me	CF ₃	H	H	OH	0
1.047	2-furyl	CF ₃	H	H	OH	0
1.048	OCH ₂ ethynyl	CF ₃	H	H	OH	0
1.049	2-pyridyl	CF ₃	H	H	OH	0
1.05	3-pyridyl	CF ₃	H	H	OH	0
1.051	4-pyridyl	CF ₃	H	H	OH	0
1.052	H	CF ₃	H	H	OH	1
1.053	F	CF ₃	H	H	OH	1
1.054	Cl	CF ₃	H	H	OH	1
1.055	Br	CF ₃	H	H	OH	1
1.056	CHF ₂	CF ₃	H	H	OH	1
1.057	CCl ₃	CF ₃	H	H	OH	1
1.058	CClF ₂	CF ₃	H	H	OH	1
1.059	CF ₃	CF ₃	H	H	OH	1
1.06	CH ₃	CF ₃	H	H	OH	1
1.061	CH ₂ CH ₃	CF ₃	H	H	OH	1
1.062	CH(CH ₃) ₂	CF ₃	H	H	OH	1

- 70 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.063	(CH ₂) ₂ CH ₃	CF ₃	H	H	OH	1
1.064	C(CH ₃) ₃	CF ₃	H	H	OH	1
1.065	Ph	CF ₃	H	H	OH	1
1.066	CH ₂ F	CF ₃	H	H	OH	1
1.067	CH ₂ Cl	CF ₃	H	H	OH	1
1.068	CH ₂ Br	CF ₃	H	H	OH	1
1.069	CH ₂ OH	CF ₃	H	H	OH	1
1.07	CH ₂ OCOCH ₃	CF ₃	H	H	OH	1
1.071	CH ₂ OCOPh	CF ₃	H	H	OH	1
1.072	CH ₂ OCH ₃	CF ₃	H	H	OH	1
1.073	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	OH	1
1.074	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	OH	1
1.075	CH ₂ SMe	CF ₃	H	H	OH	1
1.076	CH ₂ SOMe	CF ₃	H	H	OH	1
1.077	CH ₂ SO ₂ Me	CF ₃	H	H	OH	1
1.078	CH ₂ SO ₂ Ph	CF ₃	H	H	OH	1
1.079	SCH ₂ Ph	CF ₃	H	H	OH	1
1.08	SOCH ₂ Ph	CF ₃	H	H	OH	1
1.081	SO ₂ CH ₂ Ph	CF ₃	H	H	OH	1
1.082	SCH ₃	CF ₃	H	H	OH	1
1.083	SOCH ₃	CF ₃	H	H	OH	1
1.084	SO ₂ CH ₃	CF ₃	H	H	OH	1
1.085	SPh	CF ₃	H	H	OH	1
1.086	SOPh	CF ₃	H	H	OH	1
1.087	SO ₂ Ph	CF ₃	H	H	OH	1
1.088	N(CH ₃) ₂	CF ₃	H	H	OH	1
1.089	CH=CH ₂	CF ₃	H	H	OH	1
1.09	CH ₂ CH=CH ₂	CF ₃	H	H	OH	1
1.091	SO ₂ N(CH ₃) ₂	CF ₃	H	H	OH	1
1.092	ethynyl	CF ₃	H	H	OH	1
1.093	cyclopropyl	CF ₃	H	H	OH	1

- 71 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.094	OCH ₃	CF ₃	H	H	OH	1
1.095	OPh	CF ₃	H	H	OH	1
1.096	OCHF ₂	CF ₃	H	H	OH	1
1.097	CO ₂ Me	CF ₃	H	H	OH	1
1.098	2-furyl	CF ₃	H	H	OH	1
1.099	OCH ₂ CCH	CF ₃	H	H	OH	1
1.1	2-pyridyl	CF ₃	H	H	OH	1
1.101	3-pyridyl	CF ₃	H	H	OH	1
1.102	4-pyridyl	CF ₃	H	H	OH	1
1.103	H	CF ₂ CF ₃	H	H	OH	0
1.104	Cl	CF ₂ CF ₃	H	H	OH	0
1.105	CHF ₂	CF ₂ CF ₃	H	H	OH	0
1.106	CCl ₃	CF ₂ CF ₃	H	H	OH	0
1.107	CClF ₂	CF ₂ CF ₃	H	H	OH	0
1.108	CF ₃	CF ₂ CF ₃	H	H	OH	0
1.109	CH ₃	CF ₂ CF ₃	H	H	OH	0
1.11	CH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0
1.111	CH(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
1.112	(CH ₂) ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0
1.113	C(CH ₃) ₃	CF ₂ CF ₃	H	H	OH	0
1.114	CH ₂ F	CF ₂ CF ₃	H	H	OH	0
1.115	CH ₂ Cl	CF ₂ CF ₃	H	H	OH	0
1.116	CH ₂ OH	CF ₂ CF ₃	H	H	OH	0
1.117	CH ₂ OCOCH ₃	CF ₂ CF ₃	H	H	OH	0
1.118	CH ₂ OCOPh	CF ₂ CF ₃	H	H	OH	0
1.119	CH ₂ OCH ₃	CF ₂ CF ₃	H	H	OH	0
1.12	CH ₂ OCH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0
1.121	CH ₂ SMe	CF ₂ CF ₃	H	H	OH	0
1.122	CH ₂ SOMe	CF ₂ CF ₃	H	H	OH	0
1.123	CH ₂ SO ₂ Me	CF ₂ CF ₃	H	H	OH	0
1.124	CH ₂ SO ₂ Ph	CF ₂ CF ₃	H	H	OH	0

- 72 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.125	N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
1.126	CH=CH ₂	CF ₂ CF ₃	H	H	OH	0
1.127	CH ₂ CH=CH ₂	CF ₂ CF ₃	H	H	OH	0
1.128	SO ₂ N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
1.129	CCH	CF ₂ CF ₃	H	H	OH	0
1.13	cyclopropyl	CF ₂ CF ₃	H	H	OH	0
1.131	OPh	CF ₂ CF ₃	H	H	OH	0
1.132	OCH ₃	CF ₂ CF ₃	H	H	OH	0
1.133	CO ₂ Me	CF ₂ CF ₃	H	H	OH	0
1.134	OCH ₂ CCH	CF ₂ CF ₃	H	H	OH	0
1.135	2-pyridyl	CF ₂ CF ₃	H	H	OH	0
1.136	3-pyridyl	CF ₂ CF ₃	H	H	OH	0
1.137	4-pyridyl	CF ₂ CF ₃	H	H	OH	0
1.138	H	CF ₂ CF ₃	H	H	OH	1
1.139	Cl	CF ₂ CF ₃	H	H	OH	1
1.14	CHF ₂	CF ₂ CF ₃	H	H	OH	1
1.141	CCl ₃	CF ₂ CF ₃	H	H	OH	1
1.142	CClF ₂	CF ₂ CF ₃	H	H	OH	1
1.143	CF ₃	CF ₂ CF ₃	H	H	OH	1
1.144	CH ₃	CF ₂ CF ₃	H	H	OH	1
1.145	CH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	1
1.146	CH(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	1
1.147	(CH ₂) ₂ CH ₃	CF ₂ CF ₃	H	H	OH	1
1.148	C(CH ₃) ₃	CF ₂ CF ₃	H	H	OH	1
1.149	CH ₂ F	CF ₂ CF ₃	H	H	OH	1
1.15	CH ₂ Cl	CF ₂ CF ₃	H	H	OH	1
1.151	CH ₂ OH	CF ₂ CF ₃	H	H	OH	1
1.152	CH ₂ OCOCH ₃	CF ₂ CF ₃	H	H	OH	1
1.153	CH ₂ OCOPh	CF ₂ CF ₃	H	H	OH	1
1.154	CH ₂ OCH ₃	CF ₂ CF ₃	H	H	OH	1
1.155	CH ₂ OCH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	1

- 73 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.156	CH ₂ SMe	CF ₂ CF ₃	H	H	OH	1
1.157	CH ₂ SOMe	CF ₂ CF ₃	H	H	OH	1
1.158	CH ₂ SO ₂ Me	CF ₂ CF ₃	H	H	OH	1
1.159	CH ₂ SO ₂ Ph	CF ₂ CF ₃	H	H	OH	1
1.16	N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	1
1.161	CH=CH ₂	CF ₂ CF ₃	H	H	OH	1
1.162	CH ₂ CH=CH ₂	CF ₂ CF ₃	H	H	OH	1
1.163	SO ₂ N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	1
1.164	CCH	CF ₂ CF ₃	H	H	OH	1
1.165	cyclopropyl	CF ₂ CF ₃	H	H	OH	1
1.166	OPh	CF ₂ CF ₃	H	H	OH	1
1.167	OCH ₃	CF ₂ CF ₃	H	H	OH	1
1.168	CO ₂ Me	CF ₂ CF ₃	H	H	OH	1
1.169	OCH ₂ CCH	CF ₂ CF ₃	H	H	OH	1
1.17	2-pyridyl	CF ₂ CF ₃	H	H	OH	1
1.171	3-pyridyl	CF ₂ CF ₃	H	H	OH	1
1.172	4-pyridyl	CF ₂ CF ₃	H	H	OH	1
1.173	H	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.174	CHF ₂	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.175	CF ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.176	CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.177	CH ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.178	(CH ₂) ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.179	CH ₂ Cl	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.18	CH ₂ OCH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
1.181	H	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.182	CHF ₂	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.183	CF ₃	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.184	CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.185	CH ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.186	(CH ₂) ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0

- 74 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.187	CH ₂ Cl	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.188	CH ₂ OCH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	1
1.189	H	CF ₂ Cl	H	H	OH	0
1.19	Cl	CF ₂ Cl	H	H	OH	0
1.191	CHF ₂	CF ₂ Cl	H	H	OH	0
1.192	CCl ₃	CF ₂ Cl	H	H	OH	0
1.193	CClF ₂	CF ₂ Cl	H	H	OH	0
1.194	CF ₃	CF ₂ Cl	H	H	OH	0
1.195	CH ₃	CF ₂ Cl	H	H	OH	0
1.196	CH ₂ CH ₃	CF ₂ Cl	H	H	OH	0
1.197	CH(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
1.198	(CH ₂) ₂ CH ₃	CF ₂ Cl	H	H	OH	0
1.199	C(CH ₃) ₃	CF ₂ Cl	H	H	OH	0
1.2	CH ₂ F	CF ₂ Cl	H	H	OH	0
1.201	CH ₂ Cl	CF ₂ Cl	H	H	OH	0
1.202	CH ₂ OH	CF ₂ Cl	H	H	OH	0
1.203	CH ₂ OCOCH ₃	CF ₂ Cl	H	H	OH	0
1.204	CH ₂ OCOPh	CF ₂ Cl	H	H	OH	0
1.205	CH ₂ OCH ₃	CF ₂ Cl	H	H	OH	0
1.206	CH ₂ OCH ₂ CH ₃	CF ₂ Cl	H	H	OH	0
1.207	CH ₂ SMe	CF ₂ Cl	H	H	OH	0
1.208	CH ₂ SOMe	CF ₂ Cl	H	H	OH	0
1.209	CH ₂ SO ₂ Me	CF ₂ Cl	H	H	OH	0
1.21	CH ₂ SO ₂ Ph	CF ₂ Cl	H	H	OH	0
1.211	N(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
1.212	CH=CH ₂	CF ₂ Cl	H	H	OH	0
1.213	CH ₂ CH=CH ₂	CF ₂ Cl	H	H	OH	0
1.214	SO ₂ N(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
1.215	CCH	CF ₂ Cl	H	H	OH	0
1.216	cyclopropyl	CF ₂ Cl	H	H	OH	0
1.217	OPh	CF ₂ Cl	H	H	OH	0

- 75 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.218	OCH ₃	CF ₂ Cl	H	H	OH	0
1.219	CO ₂ Me	CF ₂ Cl	H	H	OH	0
1.22	OCH ₂ CCH	CF ₂ Cl	H	H	OH	0
1.221	2-pyridyl	CF ₂ Cl	H	H	OH	0
1.222	3-pyridyl	CF ₂ Cl	H	H	OH	0
1.223	4-pyridyl	CF ₂ Cl	H	H	OH	0
1.224	H	CF ₂ Cl	H	H	OH	1
1.225	Cl	CF ₂ Cl	H	H	OH	1
1.226	CHF ₂	CF ₂ Cl	H	H	OH	1
1.227	CCl ₃	CF ₂ Cl	H	H	OH	1
1.228	CClF ₂	CF ₂ Cl	H	H	OH	1
1.229	CF ₃	CF ₂ Cl	H	H	OH	1
1.23	CH ₃	CF ₂ Cl	H	H	OH	1
1.231	CH ₂ CH ₃	CF ₂ Cl	H	H	OH	1
1.232	CH(CH ₃) ₂	CF ₂ Cl	H	H	OH	1
1.233	(CH ₂) ₂ CH ₃	CF ₂ Cl	H	H	OH	1
1.234	C(CH ₃) ₃	CF ₂ Cl	H	H	OH	1
1.235	CH ₂ F	CF ₂ Cl	H	H	OH	1
1.236	CH ₂ Cl	CF ₂ Cl	H	H	OH	1
1.237	CH ₂ OH	CF ₂ Cl	H	H	OH	1
1.238	CH ₂ OCOCH ₃	CF ₂ Cl	H	H	OH	1
1.239	CH ₂ OCOPh	CF ₂ Cl	H	H	OH	1
1.24	CH ₂ OCH ₃	CF ₂ Cl	H	H	OH	1
1.241	CH ₂ OCH ₂ CH ₃	CF ₂ Cl	H	H	OH	1
1.242	CH ₂ SMe	CF ₂ Cl	H	H	OH	1
1.243	CH ₂ SOMe	CF ₂ Cl	H	H	OH	1
1.244	CH ₂ SO ₂ Me	CF ₂ Cl	H	H	OH	1
1.245	CH ₂ SO ₂ Ph	CF ₂ Cl	H	H	OH	1
1.246	N(CH ₃) ₂	CF ₂ Cl	H	H	OH	1
1.247	CH=CH ₂	CF ₂ Cl	H	H	OH	1
1.248	CH ₂ CH=CH ₂	CF ₂ Cl	H	H	OH	1

- 76 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.249	SO ₂ N(CH ₃) ₂	CF ₂ Cl	H	H	OH	1
1.25	CCH	CF ₂ Cl	H	H	OH	1
1.251	cyclopropyl	CF ₂ Cl	H	H	OH	1
1.252	OPh	CF ₂ Cl	H	H	OH	1
1.253	OCH ₃	CF ₂ Cl	H	H	OH	1
1.254	CO ₂ Me	CF ₂ Cl	H	H	OH	1
1.255	OCH ₂ CCH	CF ₂ Cl	H	H	OH	1
1.256	H	CCl ₃	H	H	OH	0
1.257	Cl	CCl ₃	H	H	OH	0
1.258	CH ₃	CCl ₃	H	H	OH	0
1.259	CH ₂ CH ₃	CCl ₃	H	H	OH	0
1.26	CH(CH ₃) ₂	CCl ₃	H	H	OH	0
1.261	(CH ₂) ₂ CH ₃	CCl ₃	H	H	OH	0
1.262	CH ₂ F	CCl ₃	H	H	OH	0
1.263	CH ₂ Cl	CCl ₃	H	H	OH	0
1.264	CH ₂ OH	CCl ₃	H	H	OH	0
1.265	CH ₂ OCOCH ₃	CCl ₃	H	H	OH	0
1.266	CH ₂ OCOPh	CCl ₃	H	H	OH	0
1.267	CH ₂ OCH ₃	CCl ₃	H	H	OH	0
1.268	CH ₂ OCH ₂ CH ₃	CCl ₃	H	H	OH	0
1.269	CH ₂ SMe	CCl ₃	H	H	OH	0
1.27	CH ₂ SOMe	CCl ₃	H	H	OH	0
1.271	CH ₂ SO ₂ Me	CCl ₃	H	H	OH	0
1.272	CH ₂ SO ₂ Ph	CCl ₃	H	H	OH	0
1.273	cyclopropyl	CCl ₃	H	H	OH	0
1.274	OPh	CCl ₃	H	H	OH	0
1.275	OCH ₃	CCl ₃	H	H	OH	0
1.276	CO ₂ Me	CCl ₃	H	H	OH	0
1.277	OCH ₂ CCH	CCl ₃	H	H	OH	0
1.278	H	CCl ₃	H	H	OH	1
1.279	Cl	CCl ₃	H	H	OH	1

- 77 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.28	CH ₃	CCl ₃	H	H	OH	1
1.281	CH ₂ CH ₃	CCl ₃	H	H	OH	1
1.282	CH(CH ₃) ₂	CCl ₃	H	H	OH	1
1.283	(CH ₂) ₂ CH ₃	CCl ₃	H	H	OH	1
1.284	CH ₂ F	CCl ₃	H	H	OH	1
1.285	CH ₂ Cl	CCl ₃	H	H	OH	1
1.286	CH ₂ OH	CCl ₃	H	H	OH	1
1.287	CH ₂ OCOCH ₃	CCl ₃	H	H	OH	1
1.288	CH ₂ OCOPh	CCl ₃	H	H	OH	1
1.289	CH ₂ OCH ₃	CCl ₃	H	H	OH	1
1.29	CH ₂ OCH ₂ CH ₃	CCl ₃	H	H	OH	1
1.291	CH ₂ SMe	CCl ₃	H	H	OH	1
1.292	CH ₂ SOMe	CCl ₃	H	H	OH	1
1.293	CH ₂ SO ₂ Me	CCl ₃	H	H	OH	1
1.294	CH ₂ SO ₂ Ph	CCl ₃	H	H	OH	1
1.295	cyclopropyl	CCl ₃	H	H	OH	1
1.296	OPh	CCl ₃	H	H	OH	1
1.297	OCH ₃	CCl ₃	H	H	OH	1
1.298	CO ₂ Me	CCl ₃	H	H	OH	1
1.299	OCH ₂ CCH	CCl ₃	H	H	OH	1
1.3	CF ₃	CHF ₂	H	H	OH	0
1.301	CH ₃	CHF ₂	H	H	OH	0
1.302	CH ₂ OCH ₃	CHF ₂	H	H	OH	0
1.303	CH ₂ Cl	CHF ₂	H	H	OH	0
1.304	CH ₂ F	CHF ₂	H	H	OH	0
1.305	CF ₃	CHF ₂	H	H	OH	1
1.306	CH ₃	CHF ₂	H	H	OH	1
1.307	CH ₂ OCH ₃	CHF ₂	H	H	OH	1
1.308	CH ₂ Cl	CHF ₂	H	H	OH	1
1.309	CH ₂ F	CHF ₂	H	H	OH	1
1.31	CH ₃	CF ₃	H	CH ₃	OH	0

- 78 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.311	CH ₃	CF ₃	H	CH ₃	OH	1
1.312	Cl	CF ₃	H	CH ₃	OH	0
1.313	CH ₃	CF ₃	CH ₃	H	OH	0
1.314	CH ₃	CF ₃	Ph	H	OH	0
1.315	CH ₃	CF ₃	Cl	H	OH	0
1.316	CH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	0
1.317	CH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	0
1.318	CH ₃	CF ₃	CH ₃	H	OH	1
1.319	CH ₃	CF ₃	Ph	H	OH	1
1.32	CH ₃	CF ₃	Cl	H	OH	1
1.321	CH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	1
1.322	CH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	1
1.323	OCH ₃	CF ₃	CH ₃	H	OH	0
1.324	CH ₂ OCH ₃	CF ₃	CH ₃	H	OH	0
1.325	CH ₂ OCH ₃	CF ₃	Ph	H	OH	0
1.326	CH ₂ OCH ₃	CF ₃	Cl	H	OH	0
1.327	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	0
1.328	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	0
1.329	CH ₂ OCH ₃	CF ₃	CH ₃	H	OH	1
1.33	CH ₂ OCH ₃	CF ₃	Ph	H	OH	1
1.331	CH ₂ OCH ₃	CF ₃	Cl	H	OH	1
1.332	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	1
1.333	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	1
1.334	COOCH ₃	H	H	H	OH	0
1.335	CF ₃	SCH ₃	H	H	OH	0
1.336	CH ₃	SCH ₃	H	H	OH	0
1.337	CF ₃	SOCH ₃	H	H	OH	0
1.338	CH ₃	SOCH ₃	H	H	OH	0
1.339	CF ₃	SO ₂ CH ₃	H	H	OH	0
1.34	CH ₃	SO ₂ CH ₃	H	H	OH	0
1.341	CF ₃	SCH ₂ CH ₃	H	H	OH	0

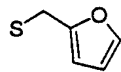
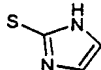
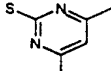
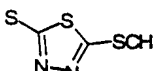
- 79 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.342	CH ₃	SCH ₂ CH ₃	H	H	OH	0
1.343	CF ₃	SOCH ₂ CH ₃	H	H	OH	0
1.344	CH ₃	SOCH ₂ CH ₃	H	H	OH	0
1.345	CF ₃	SO ₂ CH ₂ CH ₃	H	H	OH	0
1.346	CH ₃	SO ₂ CH ₂ CH ₃	H	H	OH	0
1.347	CF ₃	OCH ₃	H	H	OH	0
1.348	CH ₃	OCH ₃	H	H	OH	0
1.349	CF ₃	OCH ₂ CF ₃	H	H	OH	0
1.35	CH ₃	OCH ₂ CF ₃	H	H	OH	0
1.351	CF ₃	OCH ₂ CCH	H	H	OH	0
1.352	CH ₃	OCH ₂ CCH	H	H	OH	0
1.353	CF ₃	CN	H	H	OH	0
1.354	CH ₃	CN	H	H	OH	0
1.355	CF ₃	Cl	H	H	OH	0
1.356	CF ₃	Cl	H	H	O-NEt ₃ ⁺	0
1.357	CH ₃	Cl	H	H	OH	0
1.358	H	Cl	H	H	OH	0
1.359	CF ₃	OCH ₃	H	H	OH	0
1.36	CH ₃	OCH ₃	H	H	OH	0
1.361	CF ₃	CH ₃	H	H	OH	0
1.362	H	CF ₃	H	CH ₃	OH	0
1.363	H	CF ₃	H	CF ₃	OH	0
1.364	H	CF ₃	H	CH ₂ CH ₃	OH	0
1.365	H	CF ₃	H	CF ₃	OH	0
1.366	H	CF ₃	H	SCH ₃	OH	0
1.367	H	CF ₃	H	SOCH ₃	OH	0
1.368	H	CF ₃	H	SO ₂ CH ₃	OH	0
1.369	H	CF ₃	H	Cl	OH	0
1.37	H	CF ₃	H	OCH ₃	OH	0
1.371	H	CH ₃	H	CF ₃	OH	0
1.372	H	Cl	H	CF ₃	OH	0

- 80 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.373	H	OCH ₃	H	CF ₃	OH	0
1.374	H	SCH ₃	H	CF ₃	OH	0
1.375	H	SOCH ₃	H	CF ₃	OH	0
1.376	CH ₃	CF ₃	H	H	O-K ⁺	0
1.377	CH ₃	CF ₃	H	H	S(CH ₂) ₇ CH ₃	0
1.378	CH ₃	CF ₃	H	H	S(CH ₂) ₇ CH ₃	0
1.379	CH ₃	CF ₃	H	H	SO(CH ₂) ₇ CH ₃	0
1.38	CH ₃	CF ₃	H	H	SO ₂ (CH ₂) ₇ CH ₃	0
1.381	CH ₃	CF ₃	H	H	SPh	0
1.382	CH ₃	CF ₃	H	H	SOPh	0
1.383	CH ₃	CF ₃	H	H	SO ₂ Ph	0
1.384	CH ₃	CF ₃	H	H	NOCH ₃	0
1.385	CH ₃	CF ₃	H	H	NOCH ₂ Ph	0
1.386	CH ₃	CF ₃	H	H	NOCH ₂ CH=CH ₂	0
1.387	CH ₃	CF ₃	H	H	NOC(CH ₃) ₃	0
1.388	CH ₃	CF ₃	H	H	NOCH ₂ CH ₃	0
1.389	CH ₃	CF ₃	H	H	NCH ₂ CH ₂ SH	0
1.39	CH ₃	CF ₃	H	H	NN(CH ₃) ₂	0
1.391	CH ₃	CF ₃	H	H	NN(CH ₃)C(S)NH ₂	0
1.392	CH ₃	CF ₃	H	H	N-morpholino	0
1.393	CH ₃	CF ₃	H	H	NHCOCH ₃	0
1.394	CH ₃	CF ₃	H	H	NHCO(CH ₂) ₇ CH ₃	0
1.395	CH ₃	CF ₃	H	H	NHCOPh	0
1.396	CH ₃	CF ₃	H	H	NHSO ₂ CH ₃	0
1.397	CH ₃	CF ₃	H	H	NH(CO)S(CH ₂) ₇ CH ₃	0
1.398	CH ₃	CF ₃	H	H	Cl	0
1.399	CH ₃	CF ₃	H	H	NH ₂	0
1.4	CH ₃	CF ₃	H	H	OCOC(CH ₃) ₃	0
1.401	CH ₃	CF ₃	H	H	OCOCH ₃	0
1.402	CH ₃	CF ₃	H	H	OCOPh	0
1.403	CH ₃	CF ₃	H	H	OCO-cyclopropyl	0

- 81 -

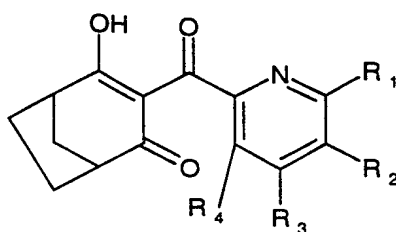
Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.404	CH ₃	CF ₃	H	H	OCOCH ₂ CH ₃	0
1.405	CH ₃	CF ₃	H	H	OCOCH=CH ₂	0
1.406	CH ₃	CF ₃	H	H	OCOCH=CHCH ₃	0
1.407	CH ₃	CF ₃	H	H	O(CO)SCH ₃	0
1.408	CH ₃	CF ₃	H	H	O(CO)S(CH ₂) ₇ CH ₃	0
1.409	CH ₃	CF ₃	H	H	O(CO)OCH ₂ CH ₃	0
1.41	CH ₃	CF ₃	H	H	O(CO)N(CH ₂ CH ₃) ₂	0
1.411	CH ₃	(CF ₂) ₃ CF ₃	H	H	OH	0
1.412	CH ₃	CF ₃	H	H	S-(4-Cl-phenyl)	0
1.413	CH ₃	CF ₃	H	H	SO-(4-Cl-phenyl)	0
1.414	CH ₃	CF ₃	H	H	SO ₂ -(4-Cl-phenyl)	0
1.415	CH ₃	CF ₃	H	H	S-(4-CF ₃ -phenyl)	0
1.416	CH ₃	CF ₃	H	H	SO-(4-CF ₃ -phenyl)	0
1.417	CH ₃	CF ₃	H	H	SO ₂ -(4-CF ₃ -phenyl)	0
1.418	CH ₃	CF ₃	H	H	S-(4-NO ₂ -phenyl)	0
1.419	CH ₃	CF ₃	H	H	SO-(4-NO ₂ -phenyl)	0
1.42	CH ₃	CF ₃	H	H	SO ₂ -(4-NO ₂ -phenyl)	0
1.421	CH ₃	CF ₃	H	H		0
1.422	CH ₃	CF ₃	H	H		0
1.423	CH ₃	CF ₃	H	H		0
1.424	CH ₃	CF ₃	H	H		0
1.425	CF ₂ H	SCH ₃	H	H	OH	0
1.426	CF ₂ Cl	SCH ₃	H	H	OH	0
1.427	CF ₂ H	SOCH ₃	H	H	OH	0
1.428	CF ₂ Cl	SOCH ₃	H	H	OH	0
1.429	CF ₂ H	SO ₂ CH ₃	H	H	OH	0
1.43	CF ₂ Cl	SO ₂ CH ₃	H	H	OH	0

- 82 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	p
1.431	CF ₂ H	SCH ₂ CH ₃	H	H	OH	0
1.432	CF ₂ Cl	SCH ₂ CH ₃	H	H	OH	0
1.433	CF ₂ H	SOCH ₂ CH ₃	H	H	OH	0
1.434	CF ₂ Cl	SOCH ₂ CH ₃	H	H	OH	0
1.435	CF ₂ H	SO ₂ CH ₂ CH ₃	H	H	OH	0
1.436	CF ₂ Cl	SO ₂ CH ₂ CH ₃	H	H	OH	0
1.437	CF ₂ H	OCH ₃	H	H	OH	0
1.438	CF ₂ Cl	OCH ₃	H	H	OH	0
1.439	CF ₂ H	OCH ₂ CF ₃	H	H	OH	0
1.44	CF ₂ Cl	OCH ₂ CF ₃	H	H	OH	0
1.441	CF ₂ H	OCH ₂ CCH	H	H	OH	0
1.442	CF ₂ Cl	OCH ₂ CCH	H	H	OH	0
1.443	CF ₂ H	CN	H	H	OH	0
1.444	CF ₂ Cl	CN	H	H	OH	0
1.445	CF ₂ H	Cl	H	H	OH	0
1.446	CF ₂ Cl	Cl	H	H	OH	0
1.447	CF ₂ H	OCH ₃	H	H	OH	0
1.448	CF ₂ Cl	OCH ₃	H	H	OH	0
1.449	CF ₃	CH ₂ OCH ₃	H	H	OH	0
1.45	CF ₃	CH ₂ OCH ₃	H	H	OH	1
1.451	CF ₂ Cl	CH ₂ OCH ₃	H	H	OH	0
1.452	CF ₂ Cl	CH ₂ OCH ₃	H	H	OH	1
1.453	CF ₂ H	CH ₂ OCH ₃	H	H	OH	0
1.454	CF ₂ H	CH ₂ OCH ₃	H	H	OH	1
1.455	CN	CF ₃	H	H	OH	0

Table 2:

- 83 -



Comp. No.	R ₁	R ₂	R ₃	R ₄
2.001	H	CF ₃	H	H
2.002	F	CF ₃	H	H
2.003	Cl	CF ₃	H	H
2.004	Br	CF ₃	H	H
2.005	CHF ₂	CF ₃	H	H
2.006	CCl ₃	CF ₃	H	H
2.007	CClF ₂	CF ₃	H	H
2.008	CF ₃	CF ₃	H	H
2.009	CH ₃	CF ₃	H	H
2.01	CH ₂ CH ₃	CF ₃	H	H
2.011	CH(CH ₃) ₂	CF ₃	H	H
2.012	(CH ₂) ₂ CH ₃	CF ₃	H	H
2.013	Ph	CF ₃	H	H
2.014	CH ₂ F	CF ₃	H	H
2.015	CH ₂ Cl	CF ₃	H	H
2.016	CH ₂ Br	CF ₃	H	H
2.017	CH ₂ OH	CF ₃	H	H
2.018	CH ₂ OCOCH ₃	CF ₃	H	H
2.019	CH ₂ OCOPh	CF ₃	H	H
2.02	CH ₂ OCH ₃	CF ₃	H	H
2.021	CH ₂ OCH ₂ CH ₃	CF ₃	H	H
2.022	CH ₂ CH ₂ OCH ₃	CF ₃	H	H
2.023	CH ₂ SMe	CF ₃	H	H
2.024	CH ₂ SOMe	CF ₃	H	H
2.025	CH ₂ SO ₂ Me	CF ₃	H	H
2.026	CH ₂ SO ₂ Ph	CF ₃	H	H

- 84 -

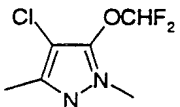
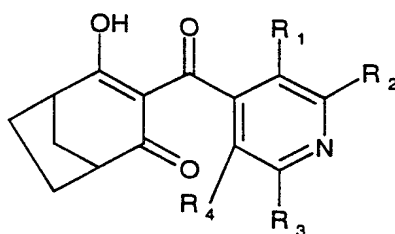
Comp. No.	R ₁	R ₂	R ₃	R ₄
2.027	SCH ₂ Ph	CF ₃	H	H
2.028	SOCH ₂ Ph	CF ₃	H	H
2.029	SO ₂ CH ₂ Ph	CF ₃	H	H
2.03	SCH ₃	CF ₃	H	H
2.031	SOCH ₃	CF ₃	H	H
2.032	SO ₂ CH ₃	CF ₃	H	H
2.033	N(CH ₃) ₂	CF ₃	H	H
2.034	CH=CH ₂	CF ₃	H	H
2.035	CH ₂ CH=CH ₂	CF ₃	H	H
2.036	SO ₂ N(CH ₃) ₂	CF ₃	H	H
2.037	CCH	CF ₃	H	H
2.038	OCH ₃	CF ₃	H	H
2.039	OPh	CF ₃	H	H
2.04	OCHF ₂	CF ₃	H	H
2.041	CO ₂ Me	CF ₃	H	H
2.042	OCH ₂ CCH	CF ₃	H	H
2.043	OCH ₂ CF ₃	CF ₃	H	H
2.044	H	CF ₃	H	Cl
2.045		F	H	Cl
2.046	CN	CF ₃	H	H
2.047	H	CHF ₂	H	H
2.048	CH ₃	CHF ₂	H	H
2.049	CH ₂ CH ₃	CHF ₂	H	H
2.05	CH ₂ OCH ₃	CHF ₂	H	H
2.051	H	CF ₂ Cl	H	H
2.052	CH ₃	CF ₂ Cl	H	H
2.053	CH ₂ CH ₃	CF ₂ Cl	H	H
2.054	CH ₂ OCH ₃	CF ₂ Cl	H	H

Table 3:

- 85 -



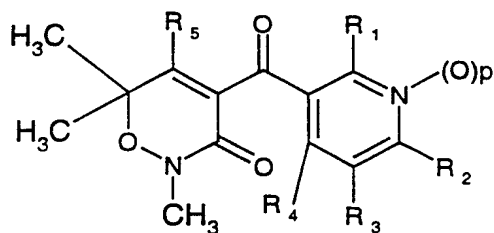
Comp. No.	R ₁	R ₂	R ₃	R ₄
3.001	H	CF ₃	H	H
3.002	F	CF ₃	H	H
3.003	Cl	CF ₃	H	H
3.004	Br	CF ₃	H	H
3.005	CHF ₂	CF ₃	H	H
3.006	CCl ₃	CF ₃	H	H
3.007	CClF ₂	CF ₃	H	H
3.008	CF ₃	CF ₃	H	H
3.009	CH ₃	CF ₃	H	H
3.01	CH ₂ CH ₃	CF ₃	H	H
3.011	CH(CH ₃) ₂	CF ₃	H	H
3.012	(CH ₂) ₂ CH ₃	CF ₃	H	H
3.013	Ph	CF ₃	H	H
3.014	CH ₂ F	CF ₃	H	H
3.015	CH ₂ Cl	CF ₃	H	H
3.016	CH ₂ Br	CF ₃	H	H
3.017	CH ₂ OH	CF ₃	H	H
3.018	CH ₂ OCOCH ₃	CF ₃	H	H
3.019	CH ₂ OCOPh	CF ₃	H	H
3.02	CH ₂ OCH ₃	CF ₃	H	H
3.021	CH ₂ OCH ₂ CH ₃	CF ₃	H	H
3.022	CH ₂ CH ₂ OCH ₃	CF ₃	H	H
3.023	CH ₂ SMe	CF ₃	H	H
3.024	CH ₂ SOMe	CF ₃	H	H
3.025	CH ₂ SO ₂ Me	CF ₃	H	H

- 86 -

Comp. No.	R ₁	R ₂	R ₃	R ₄
3.026	CH ₂ SO ₂ Ph	CF ₃	H	H
3.027	SCH ₂ Ph	CF ₃	H	H
3.028	SOCH ₂ Ph	CF ₃	H	H
3.029	SO ₂ CH ₂ Ph	CF ₃	H	H
3.03	SCH ₃	CF ₃	H	H
3.031	SOCH ₃	CF ₃	H	H
3.032	SO ₂ CH ₃	CF ₃	H	H
3.033	N(CH ₃) ₂	CF ₃	H	H
3.034	CH=CH ₂	CF ₃	H	H
3.035	CH ₂ CH=CH ₂	CF ₃	H	H
3.036	SO ₂ N(CH ₃) ₂	CF ₃	H	H
3.037	CCH	CF ₃	H	H
3.038	OCH ₃	CF ₃	H	H
3.039	OPh	CF ₃	H	H
3.04	OCHF ₂	CF ₃	H	H
3.041	CO ₂ Me	CF ₃	H	H
3.042	OCH ₂ CCH	CF ₃	H	H
3.043	OCH ₂ CF ₃	CF ₃	H	H
3.044	H	CF ₃	H	H
3.045	CN	CF ₃	H	H
3.046	H	CHF ₂	H	H
3.047	CH ₃	CHF ₂	H	H
3.048	CH ₂ CH ₃	CHF ₂	H	H
3.049	CH ₂ OCH ₃	CHF ₂	H	H
3.05	H	CF ₂ Cl	H	H
3.051	CH ₃	CF ₂ Cl	H	H
3.052	CH ₂ CH ₃	CF ₂ Cl	H	H
3.053	CH ₂ OCH ₃	CF ₂ Cl	H	H
3.054	Cl	CH ₃	H	H
3.055	CN	SCH ₃	H	H
3.056	CN	SO ₂ CH ₃	H	H

Table 4:

- 87 -



Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.001	H	CF ₃	H	H	OH	0
4.002	F	CF ₃	H	H	OH	0
4.003	Cl	CF ₃	H	H	OH	0
4.004	Br	CF ₃	H	H	OH	0
4.005	CHF ₂	CF ₃	H	H	OH	0
4.006	CCl ₃	CF ₃	H	H	OH	0
4.007	CClF ₂	CF ₃	H	H	OH	0
4.008	CF ₃	CF ₃	H	H	OH	0
4.009	CH ₃	CF ₃	H	H	OH	0
4.01	CH ₂ CH ₃	CF ₃	H	H	OH	0
4.011	CH(CH ₃) ₂	CF ₃	H	H	OH	0
4.012	(CH ₂) ₂ CH ₃	CF ₃	H	H	OH	0
4.013	C(CH ₃) ₃	CF ₃	H	H	OH	0
4.014	Ph	CF ₃	H	H	OH	0
4.015	CH ₂ F	CF ₃	H	H	OH	0
4.016	CH ₂ Cl	CF ₃	H	H	OH	0
4.017	CH ₂ Br	CF ₃	H	H	OH	0
4.018	CH ₂ OH	CF ₃	H	H	OH	0
4.019	CH ₂ OCOCH ₃	CF ₃	H	H	OH	0
4.02	CH ₂ OCOPh	CF ₃	H	H	OH	0
4.021	CH ₂ OCH ₃	CF ₃	H	H	OH	0
4.022	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	OH	0
4.023	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	OH	0

- 88 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.024	CH ₂ SMe	CF ₃	H	H	OH	0
4.025	CH ₂ SOMe	CF ₃	H	H	OH	0
4.026	CH ₂ SO ₂ Me	CF ₃	H	H	OH	0
4.027	CH ₂ SO ₂ Ph	CF ₃	H	H	OH	0
4.028	N(CH ₃) ₂	CF ₃	H	H	OH	0
4.029	CH=CH ₂	CF ₃	H	H	OH	0
4.03	CH ₂ CH=CH ₂	CF ₃	H	H	OH	0
4.031	SO ₂ N(CH ₃) ₂	CF ₃	H	H	OH	0
4.032	CCH	CF ₃	H	H	OH	0
4.033	cyclopropyl	CF ₃	H	H	OH	0
4.034	OCH ₃	CF ₃	H	H	OH	0
4.035	OPh	CF ₃	H	H	OH	0
4.036	OCHF ₂	CF ₃	H	H	OH	0
4.037	CO ₂ Me	CF ₃	H	H	OH	0
4.038	OCH ₂ CCH	CF ₃	H	H	OH	0
4.039	H	CF ₃	H	H	OH	1
4.04	F	CF ₃	H	H	OH	1
4.041	Cl	CF ₃	H	H	OH	1
4.042	Br	CF ₃	H	H	OH	1
4.043	CHF ₂	CF ₃	H	H	OH	1
4.044	CCl ₃	CF ₃	H	H	OH	1
4.045	CClF ₂	CF ₃	H	H	OH	1
4.046	CF ₃	CF ₃	H	H	OH	1
4.047	CH ₃	CF ₃	H	H	OH	1
4.048	CH ₂ CH ₃	CF ₃	H	H	OH	1
4.049	CH(CH ₃) ₂	CF ₃	H	H	OH	1
4.05	(CH ₂) ₂ CH ₃	CF ₃	H	H	OH	1
4.051	C(CH ₃) ₃	CF ₃	H	H	OH	1
4.052	Ph	CF ₃	H	H	OH	1
4.053	CH ₂ F	CF ₃	H	H	OH	1
4.054	CH ₂ Cl	CF ₃	H	H	OH	1

- 89 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.055	CH ₂ Br	CF ₃	H	H	OH	1
4.056	CH ₂ OH	CF ₃	H	H	OH	1
4.057	CH ₂ OCOCH ₃	CF ₃	H	H	OH	1
4.058	CH ₂ OCOPh	CF ₃	H	H	OH	1
4.059	CH ₂ OCH ₃	CF ₃	H	H	OH	1
4.06	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	OH	1
4.061	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	OH	1
4.062	CH ₂ SMe	CF ₃	H	H	OH	1
4.063	CH ₂ SOMe	CF ₃	H	H	OH	1
4.064	CH ₂ SO ₂ Me	CF ₃	H	H	OH	1
4.065	CH ₂ SO ₂ Ph	CF ₃	H	H	OH	1
4.066	N(CH ₃) ₂	CF ₃	H	H	OH	1
4.067	CH=CH ₂	CF ₃	H	H	OH	1
4.068	CH ₂ CH=CH ₂	CF ₃	H	H	OH	1
4.069	SO ₂ N(CH ₃) ₂	CF ₃	H	H	OH	1
4.07	CCH	CF ₃	H	H	OH	1
4.071	cyclopropyl	CF ₃	H	H	OH	1
4.072	OCH ₃	CF ₃	H	H	OH	1
4.073	OPh	CF ₃	H	H	OH	1
4.074	OCHF ₂	CF ₃	H	H	OH	1
4.075	CO ₂ Me	CF ₃	H	H	OH	1
4.076	2-furyl	CF ₃	H	H	OH	1
4.077	OCH ₂ CCH	CF ₃	H	H	OH	1
4.078	H	CF ₂ CF ₃	H	H	OH	0
4.079	Cl	CF ₂ CF ₃	H	H	OH	0
4.08	CHF ₂	CF ₂ CF ₃	H	H	OH	0
4.081	CCl ₃	CF ₂ CF ₃	H	H	OH	0
4.082	CClF ₂	CF ₂ CF ₃	H	H	OH	0
4.083	CF ₃	CF ₂ CF ₃	H	H	OH	0
4.084	CH ₃	CF ₂ CF ₃	H	H	OH	0
4.085	CH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0

- 90 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.086	CH(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
4.087	(CH ₂) ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0
4.088	C(CH ₃) ₃	CF ₂ CF ₃	H	H	OH	0
4.089	CH ₂ F	CF ₂ CF ₃	H	H	OH	0
4.09	CH ₂ Cl	CF ₂ CF ₃	H	H	OH	0
4.091	CH ₂ OH	CF ₂ CF ₃	H	H	OH	0
4.092	CH ₂ OCOCH ₃	CF ₂ CF ₃	H	H	OH	0
4.093	CH ₂ OCOPh	CF ₂ CF ₃	H	H	OH	0
4.094	CH ₂ OCH ₃	CF ₂ CF ₃	H	H	OH	0
4.095	CH ₂ OCH ₂ CH ₃	CF ₂ CF ₃	H	H	OH	0
4.096	CH ₂ SMe	CF ₂ CF ₃	H	H	OH	0
4.097	CH ₂ SOMe	CF ₂ CF ₃	H	H	OH	0
4.098	CH ₂ SO ₂ Me	CF ₂ CF ₃	H	H	OH	0
4.099	CH ₂ SO ₂ Ph	CF ₂ CF ₃	H	H	OH	0
4.1	N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
4.101	CH=CH ₂	CF ₂ CF ₃	H	H	OH	0
4.102	CH ₂ CH=CH ₂	CF ₂ CF ₃	H	H	OH	0
4.103	SO ₂ N(CH ₃) ₂	CF ₂ CF ₃	H	H	OH	0
4.104	CCH	CF ₂ CF ₃	H	H	OH	0
4.105	cyclopropyl	CF ₂ CF ₃	H	H	OH	0
4.106	OPh	CF ₂ CF ₃	H	H	OH	0
4.107	OCH ₃	CF ₂ CF ₃	H	H	OH	0
4.108	CO ₂ Me	CF ₂ CF ₃	H	H	OH	0
4.109	OCH ₂ CCH	CF ₂ CF ₃	H	H	OH	0
4.11	H	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.111	CHF ₂	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.112	CF ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.113	CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.114	CH ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.115	(CH ₂) ₂ CH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.116	CH ₂ Cl	CF ₂ CF ₂ CF ₃	H	H	OH	0

- 91 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.117	CH ₂ OCH ₃	CF ₂ CF ₂ CF ₃	H	H	OH	0
4.118	H	CF ₂ Cl	H	H	OH	0
4.119	Cl	CF ₂ Cl	H	H	OH	0
4.12	CHF ₂	CF ₂ Cl	H	H	OH	0
4.121	CCl ₃	CF ₂ Cl	H	H	OH	0
4.122	CClF ₂	CF ₂ Cl	H	H	OH	0
4.123	CF ₃	CF ₂ Cl	H	H	OH	0
4.124	CH ₃	CF ₂ Cl	H	H	OH	0
4.125	CH ₂ CH ₃	CF ₂ Cl	H	H	OH	0
4.126	CH(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
4.127	(CH ₂) ₂ CH ₃	CF ₂ Cl	H	H	OH	0
4.128	C(CH ₃) ₃	CF ₂ Cl	H	H	OH	0
4.129	CH ₂ F	CF ₂ Cl	H	H	OH	0
4.13	CH ₂ Cl	CF ₂ Cl	H	H	OH	0
4.131	CH ₂ OH	CF ₂ Cl	H	H	OH	0
4.132	CH ₂ OCOCH ₃	CF ₂ Cl	H	H	OH	0
4.133	CH ₂ OCOPh	CF ₂ Cl	H	H	OH	0
4.134	CH ₂ OCH ₃	CF ₂ Cl	H	H	OH	0
4.135	CH ₂ OCH ₂ CH ₃	CF ₂ Cl	H	H	OH	0
4.136	CH ₂ SMe	CF ₂ Cl	H	H	OH	0
4.137	CH ₂ SOMe	CF ₂ Cl	H	H	OH	0
4.138	CH ₂ SO ₂ Me	CF ₂ Cl	H	H	OH	0
4.139	CH ₂ SO ₂ Ph	CF ₂ Cl	H	H	OH	0
4.14	N(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
4.141	CH=CH ₂	CF ₂ Cl	H	H	OH	0
4.142	CH ₂ CH=CH ₂	CF ₂ Cl	H	H	OH	0
4.143	SO ₂ N(CH ₃) ₂	CF ₂ Cl	H	H	OH	0
4.144	CCH	CF ₂ Cl	H	H	OH	0
4.145	cyclopropyl	CF ₂ Cl	H	H	OH	0
4.146	OPh	CF ₂ Cl	H	H	OH	0
4.147	OCH ₃	CF ₂ Cl	H	H	OH	0

- 92 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.148	CO ₂ Me	CF ₂ Cl	H	H	OH	0
4.149	OCH ₂ CCH	CF ₂ Cl	H	H	OH	0
4.15	CH ₃	CF ₂ Cl	H	H	OH	1
4.151	CH ₂ OCH ₃	CF ₂ Cl	H	H	OH	1
4.152	H	CCl ₃	H	H	OH	0
4.153	Cl	CCl ₃	H	H	OH	0
4.154	CH ₃	CCl ₃	H	H	OH	0
4.155	CH ₂ CH ₃	CCl ₃	H	H	OH	0
4.156	CH(CH ₃) ₂	CCl ₃	H	H	OH	0
4.157	(CH ₂) ₂ CH ₃	CCl ₃	H	H	OH	0
4.158	CH ₂ F	CCl ₃	H	H	OH	0
4.159	CH ₂ Cl	CCl ₃	H	H	OH	0
4.16	CH ₂ OH	CCl ₃	H	H	OH	0
4.161	CH ₂ OCOCH ₃	CCl ₃	H	H	OH	0
4.162	CH ₂ OCOPh	CCl ₃	H	H	OH	0
4.163	CH ₂ OCH ₃	CCl ₃	H	H	OH	0
4.164	CH ₂ OCH ₂ CH ₃	CCl ₃	H	H	OH	0
4.165	CH ₂ SMe	CCl ₃	H	H	OH	0
4.166	CH ₂ SOMe	CCl ₃	H	H	OH	0
4.167	CH ₂ SO ₂ Me	CCl ₃	H	H	OH	0
4.168	CH ₂ SO ₂ Ph	CCl ₃	H	H	OH	0
4.169	cyclopropyl	CCl ₃	H	H	OH	0
4.17	OPh	CCl ₃	H	H	OH	0
4.171	OCH ₃	CCl ₃	H	H	OH	0
4.172	CO ₂ Me	CCl ₃	H	H	OH	0
4.173	OCH ₂ CCH	CCl ₃	H	H	OH	0
4.174	CF ₃	CHF ₂	H	H	OH	0
4.175	CH ₃	CHF ₂	H	H	OH	0
4.176	CH ₂ OCH ₃	CHF ₂	H	H	OH	0
4.177	CH ₂ Cl	CHF ₂	H	H	OH	0
4.178	CH ₂ F	CHF ₂	H	H	OH	0

- 93 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.179	CF ₃	CHF ₂	H	H	OH	1
4.18	CH ₃	CHF ₂	H	H	OH	1
4.181	CH ₂ OCH ₃	CHF ₂	H	H	OH	1
4.182	CH ₂ Cl	CHF ₂	H	H	OH	1
4.183	CH ₂ F	CHF ₂	H	H	OH	1
4.184	CH ₃	CF ₃	H	CH ₃	OH	0
4.185	CH ₃	CF ₃	H	CH ₃	OH	1
4.186	Cl	CF ₃	H	CH ₃	OH	0
4.187	CH ₃	CF ₃	CH ₃	H	OH	0
4.188	CH ₃	CF ₃	Ph	H	OH	0
4.189	CH ₃	CF ₃	Cl	H	OH	0
4.19	CH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	0
4.191	CH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	0
4.192	CH ₃	CF ₃	CH ₃	H	OH	1
4.193	CH ₃	CF ₃	Ph	H	OH	1
4.194	CH ₃	CF ₃	Cl	H	OH	1
4.195	CH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	1
4.196	CH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	1
4.197	OCH ₃	CF ₃	CH ₃	H	OH	0
4.198	CH ₂ OCH ₃	CF ₃	CH ₃	H	OH	0
4.199	CH ₂ OCH ₃	CF ₃	Ph	H	OH	0
4.2	CH ₂ OCH ₃	CF ₃	Cl	H	OH	0
4.201	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	0
4.202	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	0
4.203	CH ₂ OCH ₃	CF ₃	CH ₃	H	OH	1
4.204	CH ₂ OCH ₃	CF ₃	Ph	H	OH	1
4.205	CH ₂ OCH ₃	CF ₃	Cl	H	OH	1
4.206	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ CH ₃	H	OH	1
4.207	CH ₂ OCH ₃	CF ₃	CO ₂ CH ₂ Ph	H	OH	1
4.208	COOCH ₃	H	H	H	OH	0
4.209	CF ₃	SCH ₃	H	H	OH	0

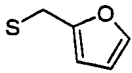
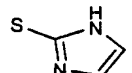
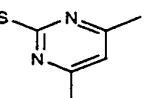
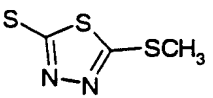
- 94 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.21	CH ₃	SCH ₃	H	H	OH	0
4.211	CF ₃	SOCH ₃	H	H	OH	0
4.212	CH ₃	SOCH ₃	H	H	OH	0
4.213	CF ₃	SO ₂ CH ₃	H	H	OH	0
4.214	CH ₃	SO ₂ CH ₃	H	H	OH	0
4.215	CF ₃	SCH ₂ CH ₃	H	H	OH	0
4.216	CH ₃	SCH ₂ CH ₃	H	H	OH	0
4.217	CF ₃	SOCH ₂ CH ₃	H	H	OH	0
4.218	CH ₃	SOCH ₂ CH ₃	H	H	OH	0
4.219	CF ₃	SO ₂ CH ₂ CH ₃	H	H	OH	0
4.22	CH ₃	SO ₂ CH ₂ CH ₃	H	H	OH	0
4.221	CF ₃	OCH ₃	H	H	OH	0
4.222	CH ₃	OCH ₃	H	H	OH	0
4.223	CF ₃	OCH ₂ CF ₃	H	H	OH	0
4.224	CH ₃	OCH ₂ CF ₃	H	H	OH	0
4.225	CF ₃	OCH ₂ CCH	H	H	OH	0
4.226	CH ₃	OCH ₂ CCH	H	H	OH	0
4.227	CF ₃	CN	H	H	OH	0
4.228	CH ₃	CN	H	H	OH	0
4.229	CF ₃	Cl	H	H	OH	0
4.23	CH ₃	Cl	H	H	OH	0
4.231	H	Cl	H	H	OH	0
4.232	CF ₃	OCH ₃	H	H	OH	0
4.233	CH ₃	OCH ₃	H	H	OH	0
4.234	CF ₃	CH ₃	H	H	OH	0
4.235	H	CF ₃	H	CH ₃	OH	0
4.236	H	CF ₃	H	CF ₃	OH	0
4.237	H	CF ₃	H	CH ₂ CH ₃	OH	0
4.238	H	CF ₃	H	CF ₃	OH	0
4.239	H	CF ₃	H	SCH ₃	OH	0
4.24	H	CF ₃	H	SOCH ₃	OH	0

- 95 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.241	H	CF ₃	H	SO ₂ CH ₃	OH	0
4.242	H	CF ₃	H	Cl	OH	0
4.243	H	CF ₃	H	OCH ₃	OH	0
4.244	H	CH ₃	H	CF ₃	OH	0
4.245	H	Cl	H	CF ₃	OH	0
4.246	H	OCH ₃	H	CF ₃	OH	0
4.247	H	SCH ₃	H	CF ₃	OH	0
4.248	H	SOCH ₃	H	CF ₃	OH	0
4.249	CH ₃	CF ₃	H	H	S(CH ₂) ₇ CH ₃	0
4.25	CH ₃	CF ₃	H	H	S(CH ₂) ₇ CH ₃	0
4.251	CH ₃	CF ₃	H	H	SO(CH ₂) ₇ CH ₃	0
4.252	CH ₃	CF ₃	H	H	SO ₂ (CH ₂) ₇ CH ₃	0
4.253	CH ₃	CF ₃	H	H	SPh	0
4.254	CH ₃	CF ₃	H	H	SOPh	0
4.255	CH ₃	CF ₃	H	H	SO ₂ Ph	0
4.256	CH ₃	CF ₃	H	H	NOCH ₃	0
4.257	CH ₃	CF ₃	H	H	NOCH ₂ Ph	0
4.258	CH ₃	CF ₃	H	H	NOCH ₂ CH=CH ₂	0
4.259	CH ₃	CF ₃	H	H	NOC(CH ₃) ₃	0
4.26	CH ₃	CF ₃	H	H	NOCH ₂ CH ₃	0
4.261	CH ₃	CF ₃	H	H	NCH ₂ CH ₂ SH	0
4.262	CH ₃	CF ₃	H	H	NN(CH ₃) ₂	0
4.263	CH ₃	CF ₃	H	H	NN(CH ₃)C(S)NH ₂	0
4.264	CH ₃	CF ₃	H	H	N-morpholino	0
4.265	CH ₃	CF ₃	H	H	NHCOCH ₃	0
4.266	CH ₃	CF ₃	H	H	NHCO(CH ₂) ₇ CH ₃	0
4.267	CH ₃	CF ₃	H	H	NHCOPh	0
4.268	CH ₃	CF ₃	H	H	NHSO ₂ CH ₃	0
4.269	CH ₃	CF ₃	H	H	NH(CO)S(CH ₂) ₇ CH ₃	0
4.27	CH ₃	CF ₃	H	H	Cl	0
4.271	CH ₃	CF ₃	H	H	NH ₂	0

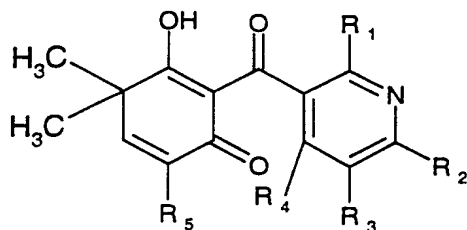
- 96 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.272	CH ₃	CF ₃	H	H	OCOC(CH ₃) ₃	0
4.273	CH ₃	CF ₃	H	H	OCOCH ₃	0
4.274	CH ₃	CF ₃	H	H	OCOPh	0
4.275	CH ₃	CF ₃	H	H	OCO-cyclopropyl	0
4.276	CH ₃	CF ₃	H	H	OCOCH ₂ CH ₃	0
4.277	CH ₃	CF ₃	H	H	OCOCH=CH ₂	0
4.278	CH ₃	CF ₃	H	H	OCOCH=CHCH ₃	0
4.279	CH ₃	CF ₃	H	H	O(CO)SCH ₃	0
4.28	CH ₃	CF ₃	H	H	O(CO)S(CH ₂) ₇ CH ₃	0
4.281	CH ₃	CF ₃	H	H	O(CO)OCH ₂ CH ₃	0
4.282	CH ₃	CF ₃	H	H	O(CO)N(CH ₂ CH ₃) ₂	0
4.283	CH ₃	(CF ₂) ₃ CF ₃	H	H	OH	0
4.284	CH ₃	CF ₃	H	H	S-(4-Cl-phenyl)	0
4.285	CH ₃	CF ₃	H	H	SO-(4-Cl-phenyl)	0
4.286	CH ₃	CF ₃	H	H	SO ₂ -(4-Cl-phenyl)	0
4.287	CH ₃	CF ₃	H	H	S-(4-CF ₃ -phenyl)	0
4.288	CH ₃	CF ₃	H	H	SO-(4-CF ₃ -phenyl)	0
4.289	CH ₃	CF ₃	H	H	SO ₂ -(4-CF ₃ -phenyl)	0
4.29	CH ₃	CF ₃	H	H	S-(4-NO ₂ -phenyl)	0
4.291	CH ₃	CF ₃	H	H	SO-(4-NO ₂ -phenyl)	0
4.292	CH ₃	CF ₃	H	H	SO ₂ -(4-NO ₂ -phenyl)	0
4.293	CH ₃	CF ₃	H	H		0
4.294	CH ₃	CF ₃	H	H		0
4.295	CH ₃	CF ₃	H	H		0
4.296	CH ₃	CF ₃	H	H		0
4.297	CF ₂ H	SCH ₃	H	H	OH	0

- 97 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅	P
4.298	CF ₂ Cl	SCH ₃	H	H	OH	0
4.299	CF ₂ H	SOCH ₃	H	H	OH	0
4.3	CF ₂ Cl	SOCH ₃	H	H	OH	0
4.301	CF ₂ H	SO ₂ CH ₃	H	H	OH	0
4.302	CF ₂ Cl	SO ₂ CH ₃	H	H	OH	0
4.303	CF ₂ H	SCH ₂ CH ₃	H	H	OH	0
4.304	CF ₂ Cl	SCH ₂ CH ₃	H	H	OH	0
4.305	CF ₂ H	SOCH ₂ CH ₃	H	H	OH	0
4.306	CF ₂ Cl	SOCH ₂ CH ₃	H	H	OH	0
4.307	CF ₂ H	SO ₂ CH ₂ CH ₃	H	H	OH	0
4.308	CF ₂ Cl	SO ₂ CH ₂ CH ₃	H	H	OH	0
4.309	CF ₂ H	OCH ₃	H	H	OH	0
4.31	CF ₂ Cl	OCH ₃	H	H	OH	0
4.311	CF ₂ H	OCH ₂ CF ₃	H	H	OH	0
4.312	CF ₂ Cl	OCH ₂ CF ₃	H	H	OH	0
4.313	CF ₂ H	OCH ₂ CCH	H	H	OH	0
4.314	CF ₂ Cl	OCH ₂ CCH	H	H	OH	0
4.315	CF ₂ H	CN	H	H	OH	0
4.316	CF ₂ Cl	CN	H	H	OH	0
4.317	CF ₂ H	Cl	H	H	OH	0
4.318	CF ₂ Cl	Cl	H	H	OH	0
4.319	CF ₂ H	OCH ₃	H	H	OH	0
4.32	CF ₂ Cl	OCH ₃	H	H	OH	0
4.321	CF ₃	CH ₂ OCH ₃	H	H	OH	0
4.322	CF ₃	CH ₂ OCH ₃	H	H	OH	1
4.323	CF ₂ Cl	CH ₂ OCH ₃	H	H	OH	0
4.324	CF ₂ Cl	CH ₂ OCH ₃	H	H	OH	1
4.325	CF ₂ H	CH ₂ OCH ₃	H	H	OH	0
4.326	CF ₂ H	CH ₂ OCH ₃	H	H	OH	1
4.327	CN	CF ₃	H	H	OH	0
4.328	SCH ₃	H	H	H	OH	0

Table 5



Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
5.001	H	CF ₃	H	H	CH ₃
5.002	F	CF ₃	H	H	CH ₃
5.003	Cl	CF ₃	H	H	CH ₃
5.004	CHF ₂	CF ₃	H	H	CH ₃
5.005	CCl ₃	CF ₃	H	H	CH ₃
5.006	CClF ₂	CF ₃	H	H	CH ₃
5.007	CF ₃	CF ₃	H	H	CH ₃
5.008	CH ₃	CF ₃	H	H	CH ₃
5.009	CH ₂ CH ₃	CF ₃	H	H	CH ₃
5.01	CH(CH ₃) ₂	CF ₃	H	H	CH ₃
5.011	(CH ₂) ₂ CH ₃	CF ₃	H	H	CH ₃
5.012	CH ₂ F	CF ₃	H	H	CH ₃
5.013	CH ₂ Cl	CF ₃	H	H	CH ₃
5.014	CH ₂ Br	CF ₃	H	H	CH ₃
5.015	CH ₂ OCOCH ₃	CF ₃	H	H	CH ₃
5.016	CH ₂ OCH ₃	CF ₃	H	H	CH ₃
5.017	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	CH ₃
5.018	CH ₂ SMe	CF ₃	H	H	CH ₃
5.019	CH ₂ SOMe	CF ₃	H	H	CH ₃
5.02	CH ₂ SO ₂ Me	CF ₃	H	H	CH ₃
5.021	N(CH ₃) ₂	CF ₃	H	H	CH ₃
5.022	CH=CH ₂	CF ₃	H	H	CH ₃
5.023	CH ₂ CH=CH ₂	CF ₃	H	H	CH ₃
5.024	SO ₂ N(CH ₃) ₂	CF ₃	H	H	CH ₃

- 99 -

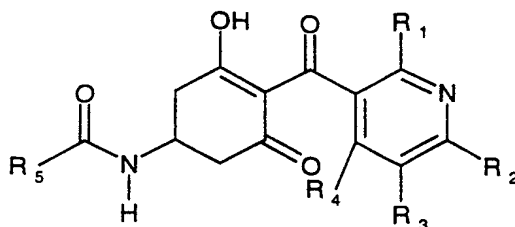
Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
5.025	CCH	CF ₃	H	H	CH ₃
5.026	cyclopropyl	CF ₃	H	H	CH ₃
5.027	OCH ₃	CF ₃	H	H	CH ₃
5.028	OPh	CF ₃	H	H	CH ₃
5.029	OCHF ₂	CF ₃	H	H	CH ₃
5.03	CO ₂ Me	CF ₃	H	H	CH ₃
5.031	OCH ₂ CCH	CF ₃	H	H	CH ₃
5.032	CF ₃	SCH ₃	H	H	CH ₃
5.033	CH ₃	SCH ₃	H	H	CH ₃
5.034	CF ₃	SOCH ₃	H	H	CH ₃
5.035	CH ₃	SOCH ₃	H	H	CH ₃
5.036	CF ₃	SO ₂ CH ₃	H	H	CH ₃
5.037	CH ₃	SO ₂ CH ₃	H	H	CH ₃
5.038	CF ₃	OCH ₃	H	H	CH ₃
5.039	CH ₃	OCH ₃	H	H	CH ₃
5.04	CF ₃	OCH ₂ CF ₃	H	H	CH ₃
5.041	CH ₃	OCH ₂ CF ₃	H	H	CH ₃
5.042	CF ₃	OCH ₂ CCH	H	H	CH ₃
5.043	CH ₃	OCH ₂ CCH	H	H	CH ₃
5.044	CF ₃	CN	H	H	CH ₃
5.045	CH ₃	CN	H	H	CH ₃
5.046	CF ₃	Cl	H	H	CH ₃
5.047	CH ₃	Cl	H	H	CH ₃
5.048	H	Cl	H	H	CH ₃
5.049	CF ₃	OCH ₃	H	H	CH ₃
5.05	CH ₃	OCH ₃	H	H	CH ₃
5.051	CF ₃	CH ₃	H	H	CH ₃
5.052	H	CF ₃	H	CH ₃	CH ₃
5.053	H	CF ₃	H	CF ₃	CH ₃
5.054	H	CF ₃	H	CH ₂ CH ₃	CH ₃
5.055	H	CF ₃	H	CF ₃	CH ₃
5.056	H	CF ₃	H	SCH ₃	CH ₃

- 100 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
5.057	H	CF ₃	H	SOCH ₃	CH ₃
5.058	H	CF ₃	H	SO ₂ CH ₃	CH ₃
5.059	H	CF ₃	H	Cl	CH ₃
5.06	H	CF ₃	H	OCH ₃	CH ₃
5.061	H	CH ₃	H	CF ₃	CH ₃
5.062	H	Cl	H	CF ₃	CH ₃
5.063	H	OCH ₃	H	CF ₃	CH ₃
5.064	H	SCH ₃	H	CF ₃	CH ₃
5.065	H	SOCH ₃	H	CF ₃	CH ₃
5.066	CF ₂ Cl	CH ₃	H	H	CH ₃
5.067	CF ₂ Cl	CH ₂ CH ₃	H	H	CH ₃
5.068	CF ₂ Cl	SCH ₃	H	H	CH ₃
5.069	CF ₂ Cl	SOCH ₃	H	H	CH ₃
5.07	CF ₂ Cl	SO ₂ CH ₃	H	H	CH ₃
5.071	CF ₂ Cl	OCH ₃	H	H	CH ₃
5.072	CF ₂ Cl	OCH ₂ CF ₃	H	H	CH ₃
5.073	CF ₂ Cl	OCH ₂ CCH	H	H	CH ₃
5.074	CF ₂ Cl	CN	H	H	CH ₃
5.075	CF ₂ Cl	Cl	H	H	CH ₃
5.076	CF ₂ Cl	OCH ₃	H	H	CH ₃
5.077	CF ₃	CH ₂ OCH ₃	H	H	CH ₃
5.078	CF ₂ Cl	CH ₂ OCH ₃	H	H	CH ₃
5.079	CF ₂ H	CH ₂ OCH ₃	H	H	CH ₃
5.08	CN	CF ₃	H	H	CH ₃
5.081	CH ₃	CF ₃	H	H	CH ₂ CH ₃
5.082	CH ₃	CF ₃	H	H	SCH ₃
5.083	CH ₃	CF ₃	H	H	SOCH ₃
5.084	CH ₃	CF ₃	H	H	SO ₂ CH ₃
5.085	CH ₃	CF ₃	H	H	H

- 101 -

Table 6:



Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
6.001	Cl	CF ₃	H	H	CH ₂ CH ₃
6.002	CHF ₂	CF ₃	H	H	CH ₂ CH ₃
6.003	CCl ₃	CF ₃	H	H	CH ₂ CH ₃
6.004	CClF ₂	CF ₃	H	H	CH ₂ CH ₃
6.005	CF ₃	CF ₃	H	H	CH ₂ CH ₃
6.006	CH ₃	CF ₃	H	H	CH ₂ CH ₃
6.007	CH ₂ CH ₃	CF ₃	H	H	CH ₂ CH ₃
6.008	(CH ₂) ₂ CH ₃	CF ₃	H	H	CH ₂ CH ₃
6.009	CH ₂ F	CF ₃	H	H	CH ₂ CH ₃
6.01	CH ₂ Cl	CF ₃	H	H	CH ₂ CH ₃
6.011	CH ₂ OCH ₃	CF ₃	H	H	CH ₂ CH ₃
6.012	CH ₂ SMe	CF ₃	H	H	CH ₂ CH ₃
6.013	CH ₂ SO ₂ Me	CF ₃	H	H	CH ₂ CH ₃
6.014	CH=CH ₂	CF ₃	H	H	CH ₂ CH ₃
6.015	CH ₂ CH=CH ₂	CF ₃	H	H	CH ₂ CH ₃
6.016	CCH	CF ₃	H	H	CH ₂ CH ₃
6.017	CF ₃	SCH ₃	H	H	CH ₂ CH ₃
6.018	CF ₃	SOCH ₃	H	H	CH ₂ CH ₃
6.019	CF ₃	SO ₂ CH ₃	H	H	CH ₂ CH ₃
6.02	CF ₃	OCH ₃	H	H	CH ₂ CH ₃
6.021	CF ₃	CN	H	H	CH ₂ CH ₃
6.022	CF ₃	Cl	H	H	CH ₂ CH ₃
6.023	CF ₃	OCH ₃	H	H	CH ₂ CH ₃
6.024	CF ₃	CH ₃	H	H	CH ₂ CH ₃

- 102 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
6.025	H	CF ₃	H	CH ₃	CH ₂ CH ₃
6.026	H	CF ₃	H	CF ₃	CH ₂ CH ₃
6.027	H	CF ₃	H	SCH ₃	CH ₂ CH ₃
6.028	H	CF ₃	H	SOCH ₃	CH ₂ CH ₃
6.029	H	CF ₃	H	SO ₂ CH ₃	CH ₂ CH ₃
6.03	H	CF ₃	H	Cl	CH ₂ CH ₃
6.031	H	CF ₃	H	OCH ₃	CH ₂ CH ₃
6.032	H	CH ₃	H	CF ₃	CH ₂ CH ₃
6.033	H	Cl	H	CF ₃	CH ₂ CH ₃
6.034	H	OCH ₃	H	CF ₃	CH ₂ CH ₃
6.035	CN	CF ₃	H	H	CH ₂ CH ₃
6.036	Cl	CF ₃	H	H	CH(CH ₃) ₂
6.037	CHF ₂	CF ₃	H	H	CH(CH ₃) ₂
6.038	CCl ₃	CF ₃	H	H	CH(CH ₃) ₂
6.039	CClF ₂	CF ₃	H	H	CH(CH ₃) ₂
6.04	CF ₃	CF ₃	H	H	CH(CH ₃) ₂
6.041	CH ₃	CF ₃	H	H	CH(CH ₃) ₂
6.042	CH ₂ CH ₃	CF ₃	H	H	CH(CH ₃) ₂
6.043	(CH ₂) ₂ CH ₃	CF ₃	H	H	CH(CH ₃) ₂
6.044	CH ₂ F	CF ₃	H	H	CH(CH ₃) ₂
6.045	CH ₂ Cl	CF ₃	H	H	CH(CH ₃) ₂
6.046	CH ₂ OCH ₃	CF ₃	H	H	CH(CH ₃) ₂
6.047	CH ₂ SMe	CF ₃	H	H	CH(CH ₃) ₂
6.048	CH ₂ SO ₂ Me	CF ₃	H	H	CH(CH ₃) ₂
6.049	CH=CH ₂	CF ₃	H	H	CH(CH ₃) ₂
6.05	CH ₂ CH=CH ₂	CF ₃	H	H	CH(CH ₃) ₂
6.051	CCH	CF ₃	H	H	CH(CH ₃) ₂
6.052	CF ₃	SCH ₃	H	H	CH(CH ₃) ₂
6.053	CF ₃	SOCH ₃	H	H	CH(CH ₃) ₂
6.054	CF ₃	SO ₂ CH ₃	H	H	CH(CH ₃) ₂
6.055	CF ₃	OCH ₃	H	H	CH(CH ₃) ₂
6.056	CF ₃	CN	H	H	CH(CH ₃) ₂

- 103 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
6.057	CF ₃	Cl	H	H	CH(CH ₃) ₂
6.058	CF ₃	OCH ₃	H	H	CH(CH ₃) ₂
6.059	CF ₃	CH ₃	H	H	CH(CH ₃) ₂
6.06	H	CF ₃	H	CH ₃	CH(CH ₃) ₂
6.061	H	CF ₃	H	CF ₃	CH(CH ₃) ₂
6.062	H	CF ₃	H	SCH ₃	CH(CH ₃) ₂
6.063	H	CF ₃	H	SOCH ₃	CH(CH ₃) ₂
6.064	H	CF ₃	H	SO ₂ CH ₃	CH(CH ₃) ₂
6.065	H	CF ₃	H	Cl	CH(CH ₃) ₂
6.066	H	CF ₃	H	OCH ₃	CH(CH ₃) ₂
6.067	H	CH ₃	H	CF ₃	CH(CH ₃) ₂
6.068	H	Cl	H	CF ₃	CH(CH ₃) ₂
6.069	H	OCH ₃	H	CF ₃	CH(CH ₃) ₂
6.07	CN	CF ₃	H	H	CH(CH ₃) ₂
6.071	Cl	CF ₃	H	H	HNPh
6.072	CHF ₂	CF ₃	H	H	HNPh
6.073	CCl ₃	CF ₃	H	H	HNPh
6.074	CClF ₂	CF ₃	H	H	HNPh
6.075	CF ₃	CF ₃	H	H	HNPh
6.076	CH ₃	CF ₃	H	H	HNPh
6.077	CH ₂ CH ₃	CF ₃	H	H	HNPh
6.078	(CH ₂) ₂ CH ₃	CF ₃	H	H	HNPh
6.079	CH ₂ F	CF ₃	H	H	HNPh
6.08	CH ₂ Cl	CF ₃	H	H	HNPh
6.081	CH ₂ OCH ₃	CF ₃	H	H	HNPh
6.082	CH ₂ SMe	CF ₃	H	H	HNPh
6.083	CH ₂ SO ₂ Me	CF ₃	H	H	HNPh
6.084	CH=CH ₂	CF ₃	H	H	HNPh
6.085	CH ₂ CH=CH ₂	CF ₃	H	H	HNPh
6.086	CCH	CF ₃	H	H	HNPh
6.087	CF ₃	SCH ₃	H	H	HNPh
6.088	CF ₃	SOCH ₃	H	H	HNPh

- 104 -

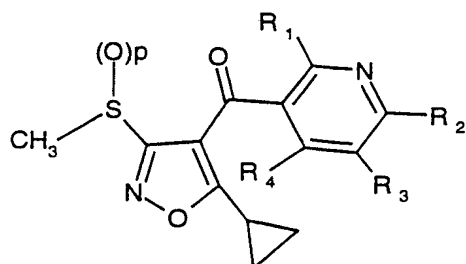
Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
6.089	CF ₃	SO ₂ CH ₃	H	H	HNPh
6.09	CF ₃	OCH ₃	H	H	HNPh
6.091	CF ₃	CN	H	H	HNPh
6.092	CF ₃	Cl	H	H	HNPh
6.093	CF ₃	OCH ₃	H	H	HNPh
6.094	CF ₃	CH ₃	H	H	HNPh
6.095	H	CF ₃	H	CH ₃	HNPh
6.096	H	CF ₃	H	CF ₃	HNPh
6.097	H	CF ₃	H	SCH ₃	HNPh
6.098	H	CF ₃	H	SOCH ₃	HNPh
6.099	H	CF ₃	H	SO ₂ CH ₃	HNPh
6.1	H	CF ₃	H	Cl	HNPh
6.101	H	CF ₃	H	OCH ₃	HNPh
6.102	H	CH ₃	H	CF ₃	HNPh
6.103	H	Cl	H	CF ₃	HNPh
6.104	H	OCH ₃	H	CF ₃	HNPh
6.105	CN	CF ₃	H	H	HNPh
6.106	Cl	CF ₃	H	H	HNC(CH ₃) ₃
6.107	CHF ₂	CF ₃	H	H	HNC(CH ₃) ₃
6.108	CCl ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.109	CClF ₂	CF ₃	H	H	HNC(CH ₃) ₃
6.11	CF ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.111	CH ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.112	CH ₂ CH ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.113	(CH ₂) ₂ CH ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.114	CH ₂ F	CF ₃	H	H	HNC(CH ₃) ₃
6.115	CH ₂ Cl	CF ₃	H	H	HNC(CH ₃) ₃
6.116	CH ₂ OCH ₃	CF ₃	H	H	HNC(CH ₃) ₃
6.117	CH ₂ SMe	CF ₃	H	H	HNC(CH ₃) ₃
6.118	CH ₂ SO ₂ Me	CF ₃	H	H	HNC(CH ₃) ₃
6.119	CH=CH ₂	CF ₃	H	H	HNC(CH ₃) ₃
6.12	CH ₂ CH=CH ₂	CF ₃	H	H	HNC(CH ₃) ₃

- 105 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	R ₅
6.121	CCH	CF ₃	H	H	HNC(CH ₃) ₃
6.122	CF ₃	SCH ₃	H	H	HNC(CH ₃) ₃
6.123	CF ₃	SOCH ₃	H	H	HNC(CH ₃) ₃
6.124	CF ₃	SO ₂ CH ₃	H	H	HNC(CH ₃) ₃
6.125	CF ₃	OCH ₃	H	H	HNC(CH ₃) ₃
6.126	CF ₃	CN	H	H	HNC(CH ₃) ₃
6.127	CF ₃	Cl	H	H	HNC(CH ₃) ₃
6.128	CF ₃	OCH ₃	H	H	HNC(CH ₃) ₃
6.129	CF ₃	CH ₃	H	H	HNC(CH ₃) ₃
6.13	H	CF ₃	H	CH ₃	HNC(CH ₃) ₃
6.131	H	CF ₃	H	CF ₃	HNC(CH ₃) ₃
6.132	H	CF ₃	H	SCH ₃	HNC(CH ₃) ₃
6.133	H	CF ₃	H	SOCH ₃	HNC(CH ₃) ₃
6.134	H	CF ₃	H	SO ₂ CH ₃	HNC(CH ₃) ₃
6.135	H	CF ₃	H	Cl	HNC(CH ₃) ₃
6.136	H	CF ₃	H	OCH ₃	HNC(CH ₃) ₃
6.137	H	CH ₃	H	CF ₃	HNC(CH ₃) ₃
6.138	H	Cl	H	CF ₃	HNC(CH ₃) ₃
6.139	H	OCH ₃	H	CF ₃	HNC(CH ₃) ₃
6.14	CN	CF ₃	H	H	HNC(CH ₃) ₃

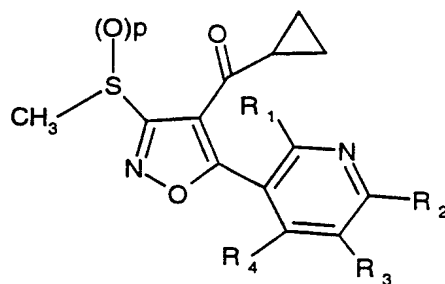
- 106 -

Table 7:



A

and



B

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.001	H	CF ₃	H	H	0
7.002	F	CF ₃	H	H	0
7.003	Cl	CF ₃	H	H	0
7.004	Br	CF ₃	H	H	0
7.005	CHF ₂	CF ₃	H	H	0
7.006	CCl ₃	CF ₃	H	H	0
7.007	CClF ₂	CF ₃	H	H	0
7.008	CF ₃	CF ₃	H	H	0
7.009	CH ₃	CF ₃	H	H	0
7.01	CH ₂ CH ₃	CF ₃	H	H	0
7.011	CH(CH ₃) ₂	CF ₃	H	H	0
7.012	(CH ₂) ₂ CH ₃	CF ₃	H	H	0
7.013	C(CH ₃) ₃	CF ₃	H	H	0
7.014	Ph	CF ₃	H	H	0
7.015	CH ₂ F	CF ₃	H	H	0
7.016	CH ₂ Cl	CF ₃	H	H	0
7.017	CH ₂ Br	CF ₃	H	H	0
7.018	CH ₂ OH	CF ₃	H	H	0
7.019	CH ₂ OCOCH ₃	CF ₃	H	H	0
7.02	CH ₂ OCOPh	CF ₃	H	H	0
7.021	CH ₂ OCH ₃	CF ₃	H	H	0
7.022	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	0

- 107 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.023	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	0
7.024	CH ₂ SMe	CF ₃	H	H	0
7.025	CH ₂ SOMe	CF ₃	H	H	0
7.026	CH ₂ SO ₂ Me	CF ₃	H	H	0
7.027	CH ₂ SO ₂ Ph	CF ₃	H	H	0
7.028	SCH ₃	CF ₃	H	H	0
7.029	SOCH ₃	CF ₃	H	H	0
7.03	SO ₂ CH ₃	CF ₃	H	H	0
7.031	N(CH ₃) ₂	CF ₃	H	H	0
7.032	CH=CH ₂	CF ₃	H	H	0
7.033	CH ₂ CH=CH ₂	CF ₃	H	H	0
7.034	SO ₂ N(CH ₃) ₂	CF ₃	H	H	0
7.035	CCH	CF ₃	H	H	0
7.036	cyclopropyl	CF ₃	H	H	0
7.037	OCH ₃	CF ₃	H	H	0
7.038	OCHF ₂	CF ₃	H	H	0
7.039	OCH ₂ CCH	CF ₃	H	H	0
7.04	H	CF ₂ CF ₃	H	H	0
7.041	Cl	CF ₂ CF ₃	H	H	0
7.042	CHF ₂	CF ₂ CF ₃	H	H	0
7.043	CCl ₃	CF ₂ CF ₃	H	H	0
7.044	CClF ₂	CF ₂ CF ₃	H	H	0
7.045	CF ₃	CF ₂ CF ₃	H	H	0
7.046	CH ₃	CF ₂ CF ₃	H	H	0
7.047	CH ₂ CH ₃	CF ₂ CF ₃	H	H	0
7.048	CH(CH ₃) ₂	CF ₂ CF ₃	H	H	0
7.049	(CH ₂) ₂ CH ₃	CF ₂ CF ₃	H	H	0
7.05	C(CH ₃) ₃	CF ₂ CF ₃	H	H	0
7.051	CH ₂ F	CF ₂ CF ₃	H	H	0
7.052	CH ₂ Cl	CF ₂ CF ₃	H	H	0
7.053	CH ₂ OH	CF ₂ CF ₃	H	H	0
7.054	CH ₂ OCOCH ₃	CF ₂ CF ₃	H	H	0

- 108 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.055	CH ₂ OCOPh	CF ₂ CF ₃	H	H	0
7.056	CH ₂ OCH ₃	CF ₂ CF ₃	H	H	0
7.057	CH ₂ OCH ₂ CH ₃	CF ₂ CF ₃	H	H	0
7.058	CH ₂ SMe	CF ₂ CF ₃	H	H	0
7.059	CH ₂ SOMe	CF ₂ CF ₃	H	H	0
7.06	CH ₂ SO ₂ Me	CF ₂ CF ₃	H	H	0
7.061	CH ₂ SO ₂ Ph	CF ₂ CF ₃	H	H	0
7.062	N(CH ₃) ₂	CF ₂ CF ₃	H	H	0
7.063	CH=CH ₂	CF ₂ CF ₃	H	H	0
7.064	CH ₂ CH=CH ₂	CF ₂ CF ₃	H	H	0
7.065	SO ₂ N(CH ₃) ₂	CF ₂ CF ₃	H	H	0
7.066	CCH	CF ₂ CF ₃	H	H	0
7.067	cyclopropyl	CF ₂ CF ₃	H	H	0
7.068	OCH ₃	CF ₂ CF ₃	H	H	0
7.069	CO ₂ Me	CF ₂ CF ₃	H	H	0
7.07	OCH ₂ CCH	CF ₂ CF ₃	H	H	0
7.071	H	CF ₂ Cl	H	H	0
7.072	Cl	CF ₂ Cl	H	H	0
7.073	CHF ₂	CF ₂ Cl	H	H	0
7.074	CCl ₃	CF ₂ Cl	H	H	0
7.075	CClF ₂	CF ₂ Cl	H	H	0
7.076	CF ₃	CF ₂ Cl	H	H	0
7.077	CH ₃	CF ₂ Cl	H	H	0
7.078	CH ₂ CH ₃	CF ₂ Cl	H	H	0
7.079	CH(CH ₃) ₂	CF ₂ Cl	H	H	0
7.08	(CH ₂) ₂ CH ₃	CF ₂ Cl	H	H	0
7.081	C(CH ₃) ₃	CF ₂ Cl	H	H	0
7.082	CH ₂ F	CF ₂ Cl	H	H	0
7.083	CH ₂ Cl	CF ₂ Cl	H	H	0
7.084	CH ₂ OH	CF ₂ Cl	H	H	0
7.085	CH ₂ OCOCH ₃	CF ₂ Cl	H	H	0
7.086	CH ₂ OCOPh	CF ₂ Cl	H	H	0

- 109 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.087	CH ₂ OCH ₃	CF ₂ Cl	H	H	0
7.088	CH ₂ OCH ₂ CH ₃	CF ₂ Cl	H	H	0
7.089	CH ₂ SMe	CF ₂ Cl	H	H	0
7.09	CH ₂ SOMe	CF ₂ Cl	H	H	0
7.091	CH ₂ SO ₂ Me	CF ₂ Cl	H	H	0
7.092	CH ₂ SO ₂ Ph	CF ₂ Cl	H	H	0
7.093	N(CH ₃) ₂	CF ₂ Cl	H	H	0
7.094	CH=CH ₂	CF ₂ Cl	H	H	0
7.095	CH ₂ CH=CH ₂	CF ₂ Cl	H	H	0
7.096	SO ₂ N(CH ₃) ₂	CF ₂ Cl	H	H	0
7.097	CCH	CF ₂ Cl	H	H	0
7.098	cyclopropyl	CF ₂ Cl	H	H	0
7.099	OCH ₃	CF ₂ Cl	H	H	0
7.1	OCH ₂ CCH	CF ₂ Cl	H	H	0
7.101	CF ₃	CHF ₂	H	H	0
7.102	CH ₃	CHF ₂	H	H	0
7.103	CH ₂ OCH ₃	CHF ₂	H	H	0
7.104	CH ₂ Cl	CHF ₂	H	H	0
7.105	CH ₂ F	CHF ₂	H	H	0
7.106	CH ₃	CF ₃	H	CH ₃	0
7.107	Cl	CF ₃	H	CH ₃	0
7.108	CH ₃	CF ₃	CH ₃	H	0
7.109	CH ₃	CF ₃	Cl	H	0
7.11	OCH ₃	CF ₃	CH ₃	H	0
7.111	CH ₂ OCH ₃	CF ₃	CH ₃	H	0
7.112	CH ₂ OCH ₃	CF ₃	Cl	H	0
7.113	COOCH ₃	H	H	H	0
7.114	CF ₃	SCH ₃	H	H	0
7.115	CH ₃	SCH ₃	H	H	0
7.116	CF ₃	SOCH ₃	H	H	0
7.117	CH ₃	SOCH ₃	H	H	0
7.118	CF ₃	SO ₂ CH ₃	H	H	0

- 110 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.119	CH ₃	SO ₂ CH ₃	H	H	0
7.12	CF ₃	OCH ₃	H	H	0
7.121	CH ₃	OCH ₃	H	H	0
7.122	CF ₃	OCH ₂ CF ₃	H	H	0
7.123	CH ₃	OCH ₂ CF ₃	H	H	0
7.124	CF ₃	OCH ₂ CCH	H	H	0
7.125	CH ₃	OCH ₂ CCH	H	H	0
7.126	CF ₃	CN	H	H	0
7.127	CH ₃	CN	H	H	0
7.128	CF ₃	Cl	H	H	0
7.129	CF ₃	Cl	H	H	0
7.13	CH ₃	Cl	H	H	0
7.131	H	Cl	H	H	0
7.132	CF ₃	OCH ₃	H	H	0
7.133	CH ₃	OCH ₃	H	H	0
7.134	CF ₃	CH ₃	H	H	0
7.135	H	CF ₃	H	CH ₃	0
7.136	H	CF ₃	H	CF ₃	0
7.137	H	CF ₃	H	CH ₂ CH ₃	0
7.138	H	CF ₃	H	CF ₃	0
7.139	H	CF ₃	H	SCH ₃	0
7.14	H	CF ₃	H	SOCH ₃	0
7.141	H	CF ₃	H	SO ₂ CH ₃	0
7.142	H	CF ₃	H	Cl	0
7.143	H	CF ₃	H	OCH ₃	0
7.144	H	CH ₃	H	CF ₃	0
7.145	H	Cl	H	CF ₃	0
7.146	H	OCH ₃	H	CF ₃	0
7.147	H	SCH ₃	H	CF ₃	0
7.148	H	SOCH ₃	H	CF ₃	0
7.149	CH ₃	(CF ₂) ₃ CF ₃	H	H	0
7.15	CF ₂ H	SCH ₃	H	H	0

- 111 -

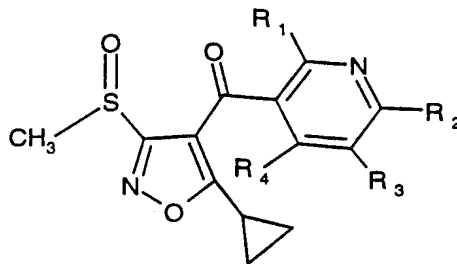
Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.151	CF ₂ Cl	SCH ₃	H	H	0
7.152	CF ₂ H	SOCH ₃	H	H	0
7.153	CF ₂ Cl	SOCH ₃	H	H	0
7.154	CF ₂ H	SO ₂ CH ₃	H	H	0
7.155	CF ₂ Cl	SO ₂ CH ₃	H	H	0
7.156	CF ₂ H	OCH ₃	H	H	0
7.157	CF ₂ Cl	OCH ₃	H	H	0
7.158	CF ₂ H	OCH ₂ CF ₃	H	H	0
7.159	CF ₂ Cl	OCH ₂ CF ₃	H	H	0
7.16	CF ₂ H	OCH ₂ CCH	H	H	0
7.161	CF ₂ Cl	OCH ₂ CCH	H	H	0
7.162	CF ₂ H	CN	H	H	0
7.163	CF ₂ Cl	CN	H	H	0
7.164	CF ₂ H	Cl	H	H	0
7.165	CF ₂ Cl	Cl	H	H	0
7.166	CF ₂ H	OCH ₃	H	H	0
7.167	CF ₂ Cl	OCH ₃	H	H	0
7.168	CF ₃	CH ₂ OCH ₃	H	H	0
7.169	CF ₂ Cl	CH ₂ OCH ₃	H	H	0
7.17	CF ₂ H	CH ₂ OCH ₃	H	H	0
7.171	CN	CF ₃	H	H	0
7.172	H	CF ₃	H	H	2
7.173	F	CF ₃	H	H	2
7.174	Cl	CF ₃	H	H	2
7.175	Br	CF ₃	H	H	2
7.176	CHF ₂	CF ₃	H	H	2
7.177	CCl ₃	CF ₃	H	H	2
7.178	CClF ₂	CF ₃	H	H	2
7.179	CF ₃	CF ₃	H	H	2
7.18	CH ₃	CF ₃	H	H	2
7.181	CH ₂ CH ₃	CF ₃	H	H	2
7.182	CH(CH ₃) ₂	CF ₃	H	H	2

- 112 -

Comp. No.	R ₁	R ₂	R ₃	R ₄	p
7.183	(CH ₂) ₂ CH ₃	CF ₃	H	H	2
7.184	C(CH ₃) ₃	CF ₃	H	H	2
7.185	Ph	CF ₃	H	H	2
7.186	CH ₂ F	CF ₃	H	H	2
7.187	CH ₂ Cl	CF ₃	H	H	2
7.188	CH ₂ Br	CF ₃	H	H	2
7.189	CH ₂ OH	CF ₃	H	H	2
7.19	CH ₂ OCOCH ₃	CF ₃	H	H	2
7.191	CH ₂ OCOPh	CF ₃	H	H	2
7.192	CH ₂ OCH ₃	CF ₃	H	H	2
7.193	CH ₂ OCH ₂ CH ₃	CF ₃	H	H	2
7.194	CH ₂ CH ₂ OCH ₃	CF ₃	H	H	2
7.195	CH ₂ SMe	CF ₃	H	H	2
7.196	CH ₂ SOMe	CF ₃	H	H	2
7.197	CH ₂ SO ₂ Me	CF ₃	H	H	2
7.198	CH ₂ SO ₂ Ph	CF ₃	H	H	2
7.199	SCH ₃	CF ₃	H	H	2
7.2	SOCH ₃	CF ₃	H	H	2
7.201	SO ₂ CH ₃	CF ₃	H	H	2
7.202	N(CH ₃) ₂	CF ₃	H	H	2
7.203	CH=CH ₂	CF ₃	H	H	2
7.204	CH ₂ CH=CH ₂	CF ₃	H	H	2
7.205	SO ₂ N(CH ₃) ₂	CF ₃	H	H	2
7.206	CCH	CF ₃	H	H	2
7.207	cyclopropyl	CF ₃	H	H	2
7.208	OCH ₃	CF ₃	H	H	2
7.209	OCHF ₂	CF ₃	H	H	2
7.21	OCH ₂ CCH	CF ₃	H	H	2

- 113 -

Table 8

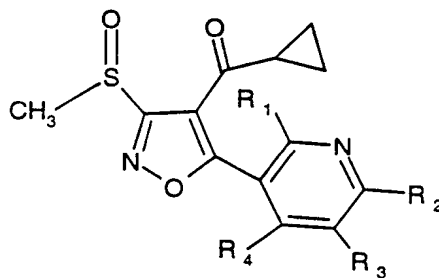


Comp. No.	R ₁	R ₂	R ₃	R ₄
8.001	H	CF ₃	H	H
8.002	F	CF ₃	H	H
8.003	Cl	CF ₃	H	H
8.004	Br	CF ₃	H	H
8.005	CHF ₂	CF ₃	H	H
8.006	CCl ₃	CF ₃	H	H
8.007	CClF ₂	CF ₃	H	H
8.008	CF ₃	CF ₃	H	H
8.009	CH ₃	CF ₃	H	H
8.01	CH ₂ CH ₃	CF ₃	H	H
8.011	CH(CH ₃) ₂	CF ₃	H	H
8.012	(CH ₂) ₂ CH ₃	CF ₃	H	H
8.013	C(CH ₃) ₃	CF ₃	H	H
8.014	Ph	CF ₃	H	H
8.015	CH ₂ F	CF ₃	H	H
8.016	CH ₂ Cl	CF ₃	H	H
8.017	CH ₂ Br	CF ₃	H	H
8.018	CH ₂ OH	CF ₃	H	H
8.019	CH ₂ OCOCH ₃	CF ₃	H	H
8.02	CH ₂ OCOPh	CF ₃	H	H
8.021	CH ₂ OCH ₃	CF ₃	H	H
8.022	CH ₂ OCH ₂ CH ₃	CF ₃	H	H
8.023	CH ₂ CH ₂ OCH ₃	CF ₃	H	H
8.024	CH ₂ SMe	CF ₃	H	H

- 114 -

Comp. No.	R ₁	R ₂	R ₃	R ₄
8.025	CH ₂ SOMe	CF ₃	H	H
8.026	CH ₂ SO ₂ Me	CF ₃	H	H
8.027	CH ₂ SO ₂ Ph	CF ₃	H	H
8.028	SCH ₃	CF ₃	H	H
8.029	SOCH ₃	CF ₃	H	H
8.03	SO ₂ CH ₃	CF ₃	H	H
8.031	N(CH ₃) ₂	CF ₃	H	H
8.032	CH=CH ₂	CF ₃	H	H
8.033	CH ₂ CH=CH ₂	CF ₃	H	H
8.034	SO ₂ N(CH ₃) ₂	CF ₃	H	H
8.035	CCH	CF ₃	H	H
8.036	cyclopropyl	CF ₃	H	H
8.037	OCH ₃	CF ₃	H	H
8.038	OCHF ₂	CF ₃	H	H
8.039	OCH ₂ CCH	CF ₃	H	H

Table 9:



Comp. No.	R ₁	R ₂	R ₃	R ₄
9.001	H	CF ₃	H	H
9.002	F	CF ₃	H	H
9.003	Cl	CF ₃	H	H
9.004	Br	CF ₃	H	H
9.005	CHF ₂	CF ₃	H	H
9.006	CCl ₃	CF ₃	H	H

- 115 -

Comp. No.	R ₁	R ₂	R ₃	R ₄
9.007	CClF ₂	CF ₃	H	H
9.008	CF ₃	CF ₃	H	H
9.009	CH ₃	CF ₃	H	H
9.01	CH ₂ CH ₃	CF ₃	H	H
9.011	CH(CH ₃) ₂	CF ₃	H	H
9.012	(CH ₂) ₂ CH ₃	CF ₃	H	H
9.013	C(CH ₃) ₃	CF ₃	H	H
9.014	Ph	CF ₃	H	H
9.015	CH ₂ F	CF ₃	H	H
9.016	CH ₂ Cl	CF ₃	H	H
9.017	CH ₂ Br	CF ₃	H	H
9.018	CH ₂ OH	CF ₃	H	H
9.019	CH ₂ OCOCH ₃	CF ₃	H	H
9.02	CH ₂ OCOPh	CF ₃	H	H
9.021	CH ₂ OCH ₃	CF ₃	H	H
9.022	CH ₂ OCH ₂ CH ₃	CF ₃	H	H
9.023	CH ₂ CH ₂ OCH ₃	CF ₃	H	H
9.024	CH ₂ SMe	CF ₃	H	H
9.025	CH ₂ SOMe	CF ₃	H	H
9.026	CH ₂ SO ₂ Me	CF ₃	H	H
9.027	CH ₂ SO ₂ Ph	CF ₃	H	H
9.028	SCH ₃	CF ₃	H	H
9.029	SOCH ₃	CF ₃	H	H
9.03	SO ₂ CH ₃	CF ₃	H	H
9.031	N(CH ₃) ₂	CF ₃	H	H
9.032	CH=CH ₂	CF ₃	H	H
9.033	CH ₂ CH=CH ₂	CF ₃	H	H
9.034	SO ₂ N(CH ₃) ₂	CF ₃	H	H
9.035	CCH	CF ₃	H	H
9.036	cyclopropyl	CF ₃	H	H
9.037	OCH ₃	CF ₃	H	H
9.038	OCHF ₂	CF ₃	H	H

- 116 -

Comp. No.	R ₁	R ₂	R ₃	R ₄
9.039	OCH ₂ CCH	CF ₃	H	H

Physical data (melting points in°C):

Comp. No.

1.001	resin
1.005	crystals m.p. 61-62
1.008	oil
1.009	crystals m.p. 75-77
1.01	oil
1.011	crystals m.p. 111-112
1.012	crystals m.p. 87-88
1.013	crystals m.p. 112-114
1.014	oil
1.021	crystals m.p. 128-129
1.023	crystals m.p. 91-92
1.024	oil
1.026	amorphous
1.028	amorphous
1.03	resin
1.031	crystals m.p. 145-146
1.042	oil
1.043	crystals m.p. 107-110
1.047	crystals m.p. 155-156
1.048	viscous
1.05	crystals m.p. 51-53
1.06	crystals m.p. >220
1.109	oil
1.195	oil
1.258	crystals m.p. 119-121

- 117 -

1.31	crystals m.p. 92-94
1.312	viscous
1.313	crystals m.p. 137-138
1.314	oil
1.316	resin
1.323	oil
1.334	resin
1.335	crystals m.p. 140-142
1.339	crystals m.p. 137-139
1.341	resin
1.343	crystals m.p. 97-99
1.347	crystals m.p. 135-137
1.349	oil, n_D 1.4965
1.351	crystals m.p. 125-127
1.353	resin, n_D 1.5289
1.355	crystals m.p. 90-92
1.356	resin
1.358	resin
1.361	oil
1.362	crystals m.p. 139-142
1.371	crystals m.p. 96-97
1.372	resin
1.373	resin
1.374	crystals m.p. 116-1199
1.375	resin
1.376	crystals m.p. >270
1.381	crystals m.p. 117-118
1.383	crystals m.p. 172-173
1.384	resin
1.385	resin
1.386	resin
1.387	resin
1.388	crystals m.p. 102-104

- 118 -

1.389	crystals m.p. 143-145
1.39	crystals m.p. 195-197
1.391	solid
1.392	crystals m.p. 202-206
1.398	crystals m.p. 137-138
1.399	crystals m.p. 262-263
1.4	oil
1.401	oil
1.402	oil
1.403	oil
1.404	oil
1.405	viscous
1.406	oil
1.408	oil
1.409	oil
1.41	oil
1.411	crystals m.p. 98-100
1.412	crystals m.p. 130-131
1.413	crystals m.p. 167-170
1.414	crystals m.p. 166-167
1.415	crystals m.p. 91-93
1.418	crystals m.p. 149-150
1.421	crystals m.p. 88-89
1.422	crystals m.p. 175-177
1.423	crystals m.p. 45-47
1.424	crystals m.p. 102-104
2.001	resin
2.003	oil
2.03	crystals m.p. 107-110
2.038	crystals m.p. 111-113
2.043	resin
2.044	crystals m.p. 105-106
2.045	amorphous

- 119 -

3.001	crystals m.p. 95-97
3.054	oil
3.055	crystals m.p. 108-110
3.056	resin, n_D 1.5509
4.009	crystals m.p. 107-109
4.01	oil
4.011	oil
4.014	crystals m.p. 148-149
4.021	crystals m.p. 44-45
4.033	crystals m.p. 46-48
4.124	crystals m.p. 46-48
4.328	oil
5.008	resin
5.081	resin
5.083	crystals m.p. 161-162
5.084	crystals m.p. 215-216
5.085	resin
6.006	crystals m.p. 176-177
6.041	crystals m.p. 186-187
6.076	crystals m.p. 195-196
6.111	crystals m.p. 163-164
7.009	ratio A: B = 2:1. H-NMR($CDCl_3$, ppm) SCH_3 : A: 2.50; B: 2.66.
7.01	ratio A: B = 5:1. H-NMR($CDCl_3$, ppm) SCH_3 : A: 2.50; B: 2.64.
7.011	ratio A: B = 9:1. H-NMR($CDCl_3$, ppm) SCH_3 : A: 2.46; B: 2.59.
7.021	ratio A: B = 3:1. H-NMR($CDCl_3$, ppm) SCH_3 : A: 2.50; B: 2.62.
7.18	ratio A: B = 2:1. H-NMR($CDCl_3$, ppm) SO_2CH_3 : A: 3.40; B: 3.58.
7.182	ratio A: B = 9:1. H-NMR($CDCl_3$, ppm) SO_2CH_3 : A: 3.32; B: 3.50.
7.192	ratio A: B = 3:1. H-NMR($CDCl_3$, ppm) SO_2CH_3 : A: 3.40; B: 3.58.
8.009	crystals m.p. 96-97
8.01	amorphous
8.011	oil
8.021	oil
9.009	crystals m.p. 112-113

- 120 -

- 9.01 amorphous
- 9.011 amorphous
- 9.021 oil

Biological Examples

Example B1: Herbical action before emergence of the plants (pre-emergence action)

Monocotyledonous and dicotyledonous test plants are sown in standard soil in plastic pots. Immediately after sowing, the test substances are sprayed on (500 l of water/ha) as an aqueous suspension (prepared from a 25% wettable powder (Example F3, b) according to WO 97/34485) or emulsion (prepared from a 25% emulsion concentrate (Example F1, c)), corresponding to a dosage of 2 kg of AS/ha. The test plants are then grown under optimum conditions in a greenhouse. After a test period of 3 weeks, the test is evaluated with a nine-level scale of ratings (1 = complete damage, 9 = no effect). Ratings of 1 to 4 (in particular 1 to 3) mean good to very good herbicidal action.

Table B1: pre-emergence action:

Test plant	Avena	Cyperus	Setaria	Sinapis	Solanum	Stellaria
<u>Active compound No.</u>						
1.009	2	1	1	2	1	2
1.376	2	1	1	2	1	2
4.009	1	2	1	2	1	3
7.009	4	2	1	3	1	2
1.381	4	1	2	2	1	1
1.011	2	1	1	1	1	1
5.008	2	1	1	2	1	2
4.021	2	1	2	2	1	2
1.010	2	1	1	1	1	2
1.021	4	2	1	1	1	3
1.398	2	1	1	1	1	1
1.195	2	1	1	1	1	2

- 121 -

4.124	2	1	2	2	1	2
1.411	3	2	1	2	1	2
1.042	4	2	2	1	1	4
1.023	2	2	2	1	1	2
1.109	2	2	2	2	1	3
1.313	3	1	2	1	1	2
1.401	2	1	1	2	1	2
1.404	2	1	1	2	1	2
1.400	2	1	1	2	1	2
1.403	2	1	1	1	1	2
1.405	2	1	1	1	1	2
1.406	2	1	1	1	1	2
1.402	2	1	1	2	1	2
1.005	4	1	1	1	1	1
1.043	4	2	1	2	1	2
1.409	1	1	1	1	1	1
1.41	2	1	1	1	1	1
1.06	2	1	1	2	1	1
7.192	4	2	2	3	2	2
7.021	1	1	1	1	1	1

The same results are obtained when the compounds of the formula I are formulated according to Examples F2 and F4 to F8 according to WO 97/34485.

Example B2: Post-emergence herbicidal action

Monocotyledonous and dicotyledonous test plants are grown in plastic pots with standard soil in a greenhouse and, in the 4- to 6-leaf stage, are sprayed with an aqueous suspension of the test substances of the formula I, prepared from a 25% wettable powder (Example F3, b) according to WO 97/34485) or with an emulsion of the test substances of the formula I, prepared from a 25% emulsion concentrate (Example F1, c) according to WO 97/34485), corresponding to a dosage of 2 kg of AS/ha (500 l of water/ha). The test plants are then grown further under optimum conditions in a greenhouse. After a test period of about 18 days, the test is evaluated with a nine-level scale of rating (1 = complete damage, 9 = no

- 122 -

effect). Ratings of 1 to 4 (in particular 1 to 3) mean good to very good herbicidal action. In this test, the compounds of the formula I show strong herbicidal action.

Table B2: post-emergence action:

Test plant	Avena	Setaria	Solanum	Sinapis	Stellaria
<u>Active compound No.</u>					
1.009	1	1	1	1	2
1.376	1	2	2	1	2
4.009	1	1	1	1	1
1.026	3	1	1	1	2
7.009	3	2	1	1	1
1.381	2	2	2	2	2
1.011	2	2	2	2	2
5.008	2	3	1	1	2
5.085	3	2	2	1	2
4.021	2	2	1	1	2
1.012	3	2	2	1	2
1.010	2	2	2	1	4
4.010	3	3	2	2	2
1.021	2	4	2	1	2
1.398	2	2	2	1	2
1.195	2	2	2	1	2
4.124	2	2	1	1	2
1.411	2	2	2	1	2
1.008	2	2	2	1	2
6.006	2	5	2	2	2
5.081	3	2	1	1	2
1.042	2	2	2	1	2
1.023	2	2	2	1	2
1.109	2	2	2	1	2
1.313	2	2	2	1	2

- 123 -

1.401	2	2	2	2	2
1.404	2	2	1	1	2
1.400	2	2	2	1	2
1.403	2	2	2	1	2
1.403	2	2	2	1	2
1.405	2	2	2	1	2
1.406	2	2	1	1	2
1.402	2	2	2	1	2
1.001	3	2	2	1	2
1.005	2	2	2	1	2
1.362	3	2	2	1	2
1.043	2	2	2	1	2
1.409	2	1	1	1	2
1.410	1	1	1	1	1
1.060	2	1	1	1	2
7.192	2	3	3	2	2
7.021	1	2	1	1	2
1.048	2	1	1	1	2

The same results are obtained when the compounds of the formula I are formulated according to Examples F2 and F4 to F8 according to WO 97/34485.

Example B3: Herbicidal action before emergence of the plants (pre-emergence action)

Monocotyledonous and dicotyledonous test plants are sown in pots in standard soil. Immediately after sowing, the test substances are sprayed on (500 l of spray liquor/ha) as an aqueous suspension, prepared from a wettable powder WP10 corresponding to the desired dosage (250 g of a.i./ha).

The test plants are then grown under optimum conditions in a greenhouse.

After a test period of 3 weeks, the test is evaluated with a nine-level scale of ratings (1 = complete damage, 9 = no effect). Ratings of 1 to 4 (in particular 1 to 3) mean good to very good herbicidal action, 7-9 mean good tolerance.

- 124 -

Table B3: Pre-emergence action:

Test plant	Abutilon	Amar-anthus	Cheno-podium	Kochia	Sida	Stellaria	Dose [g of AS/ha]
<u>Active compound</u>							
<u>No.</u>							
1.355	1	1	1	1	2	2	250
1.347	2	2	1	1	4	1	250
1.335	1	2	1	5	2	7	250
1.349	1	3	1	4	2	5	250
1.339	2	1	1	7	2	1	250
1.341	3	9	1	9	4	1	250
1.343	1	4	1	9	3	5	250

The same results are obtained when the compounds of the formula I are formulated according to Examples F2 and F4 to F8 according to WO 97/34485.

Example B4: Herbicidal action after the emergence of the plants (post-emergence action)

Monocotyledonous and dicotyledonous test plants are sown in pots in standard soil. In the 2-3-leaf stage of the test plants, the test substances are sprayed on (500 l of spray liquor/ha) as an aqueous suspension, prepared from a wettable powder WP10 according to the desired dosage (250 g of a.i./ha). 0.2% of X77 is added as wetting agent to the spray liquor. The test plants are then grown under optimum conditions in a greenhouse.

After a test period of 3 weeks, the test is evaluated with a nine-level scale of ratings (1 = complete damage, 9 = no effect). Ratings of 1 to 4 (in particular 1 to 3) mean good to very good herbicidal action, 7-9 mean good tolerance.

- 125 -

Table B4: Post-emergence action:

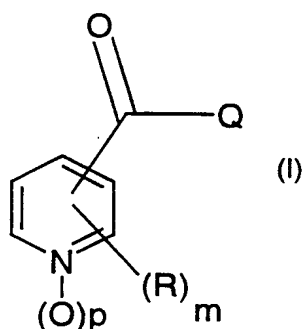
Test plant	Abutilon	Amar-anthus	Cheno-podium	Kochia	Setaria	Stellaria	Dose [g of AS/ha]
<u>Active compound</u>							
<u>No.</u>							
1.355	2	2	2	3	2	3	250
1.347	3	2	2	2	3	3	250
1.335	3	2	2	2	2	3	250
1.349	2	2	2	2	2	3	250
1.339	2	2	3	1	4	3	250
1.351	5	2	3	3	3	3	250
1.341	5	2	3	4	5	4	250
1.343	3	2	2	3	9	3	250
1.361	2	2	2	2	2	3	250

The same results are obtained when the compounds of the formula I are formulated according to Examples F2 and F4 to F8 according to WO 97/34485.

- 126 -

WHAT IS CLAIMED IS:

1. A compound of the formula I



in which

each R independently is C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₂-C₆haloalkynyl, C₃-C₆cycloalkyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkyl, C₁-C₆haloalkylthio, C₁-C₆haloalkylsulfinyl, C₁-C₆haloalkylsulfonyl, C₁-C₆alkoxycarbonyl, C₁-C₆alkylcarbonyl, C₁-C₆alkylamino, di-C₁-C₆alkylamino, C₁-C₆alkylaminosulfonyl, di-C₁-C₆alkylaminosulfonyl, -N(R₁)-S-R₂, -N(R₃)-SO-R₄, -N(R₅)-SO₂-R₆, nitro, cyano, halogen, hydroxyl, amino, formyl, hydroxy-C₁-C₆alkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₁-C₆alkoxycarbonyloxy-C₁-C₆alkyl, C₁-C₆alkylthio-C₁-C₆alkyl, C₁-C₆alkylsulfinyl-C₁-C₆alkyl, C₁-C₆alkylsulfonyl-C₁-C₆alkyl, thiocyanato-C₁-C₆alkyl, cyano-C₁-C₆alkyl, oxiranyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, C₁-C₆alkoxy-C₁-C₆alkoxy, cyano-C₁-C₆alkenyloxy, C₁-C₆alkoxycarbonyloxy-C₁-C₆alkoxy, C₃-C₆alkynyloxy, cyano-C₁-C₆alkoxy, C₁-C₆alkoxycarbonyl-C₁-C₆alkoxy, C₁-C₆alkylthio-C₁-C₆alkoxy, alkoxycarbonyl-C₁-C₆alkylthio, alkoxycarbonyl-C₁-C₆alkylsulfinyl, alkoxycarbonyl-C₁-C₆alkylsulfonyl, C₁-C₆alkylsulfonyloxy, C₁-C₆haloalkylsulfonyloxy, phenyl, benzyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, benzylthio, benzylsulfinyl or benzylsulfonyl, where the phenyl groups may be mono- or polysubstituted by halogen, methyl, ethyl, trifluoromethyl, methoxy or nitro, or R is a five- to ten-membered monocyclic or fused bicyclic ring system, which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, where the ring system is either attached directly to the pyridine ring or attached to the pyridine ring via a C₁-C₄alkylene group, and where each ring system may not contain more than 2 oxygen atoms and not more than two sulfur

- 127 -

atoms, and where the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₇, NR₈R₉, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

m is 1, 2, 3 or 4;

p is 0 or 1;

R₁, R₃ and R₅ independently of one another are hydrogen or C₁-C₆alkyl;

R₂ is NR₁₀R₁₁, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₄ is NR₁₂R₁₃, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₆ is NR₁₄R₁₅, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

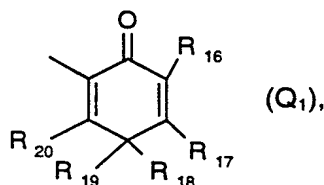
R₇ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₈, R₁₀, R₁₂ and R₁₄ independently of one another are hydrogen or C₁-C₆alkyl;

R₉, R₁₁, R₁₃ and R₁₅ independently of one another are C₁-C₆alkyl or C₁-C₆alkoxy;

Q is the group Q₁

- 128 -



in which

R₁₆, R₁₇, R₁₈ and R₁₉ independently of one another are hydrogen, hydroxyl, C₁-C₄alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₄alkoxycarbonyl, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-NHS(O)₂, C₁-C₄haloalkyl, -NH-C₁-C₄alkyl, -N(C₁-C₄alkyl)₂, C₁-C₆alkoxy, cyano, nitro, halogen or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano; or two adjacent substituents from the group consisting of R₁₆, R₁₇, R₁₈ and R₁₉ form a C₂-C₆alkylene bridge;

R₂₀ is hydroxyl, O⁻M⁺, halogen, cyano, SCN, OCN, C₁-C₁₂alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₄alkoxy, C₁-C₁₂alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₆alkoxy-C₁-C₆alkylthio, C₁-C₆alkoxy-C₁-C₆alkylsulfinyl, C₁-C₆alkoxy-C₁-C₆alkylsulfonyl, C₂-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂alkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₂-C₁₂haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylthio, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfonyl, (C₁-C₄alkoxy)₂P(O)O, C₁-C₄alkyl-(C₁-C₄alkoxy)P(O)O, H(C₁-C₄alkoxy)P(O)O,

R₃₇R₃₈N, R₇₁R₇₂NNH-, R₂₁R₂₂NC(O)O-, R₇₃R₇₄NC(O)NH-, C₁-C₄alkyl-S(O)₂NR₃₉, C₁-C₄haloalkyl-S(O)₂NR₄₀, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C₁-C₆alkoxy, C₁-C₆alkylthio or cyano, C₂-C₁₈alkenylcarbonyloxy, C₂-C₁₈alkynylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂alkoxycarbonyloxy, C₁-C₁₂alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbonyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl,

C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano,

or a group Ar₁-thio, Ar₂-sulfinyl, Ar₃-sulfonyl, -OCO-Ar₄ or NH-Ar₅ in which Ar₁, Ar₂, Ar₃, Ar₄ and Ar₅ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₄₁, NR₄₂R₄₃, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₄₁ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

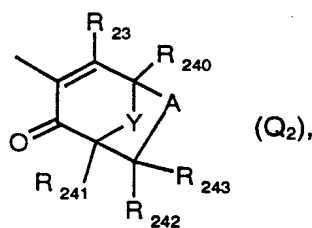
R₄₂ is hydrogen or C₁-C₆alkyl;

R₄₃ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₂₁, R₃₇, R₃₉, R₄₀, R₇₁ and R₇₃ independently of one another are hydrogen or C₁-C₄alkyl;

R₂₂, R₃₈, R₇₂ and R₇₄ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₂₁ and R₂₂ together or R₃₇ and R₃₈ together or R₇₁ and R₇₂ together or R₇₃ and R₇₄ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups; or are the group Q₂

- 130 -



in which

Y is a chemical bond, an alkylene group A₁, carbonyl, oxygen, sulfur, sulfinyl, sulfonyl, -NHR₂₄₈ or NH(CO)R₂₄₉;

A₁ is C(R₂₄₆R₂₄₇)m₀₁;

A is C(R₂₄₄R₂₄₅)r;

r and m₀₁ independently of one another are 0, 1 or 2;

R₂₄₀ is hydrogen, methyl or C₁-C₃alkoxycarbonyl;

R₂₄₁, R₂₄₂, R₂₄₃, R₂₄₄, R₂₄₅, R₂₄₆ and R₂₄₇ independently of one another are hydrogen, halogen or methyl, or R₂₄₃ together with an adjacent group R₂₄₅ or R₂₄₇ is a chemical bond;

R₂₄₈ and R₂₄₉ independently of one another are hydrogen or C₁-C₄alkyl;

R₂₃ is hydroxyl, O⁻M⁺, halogen, cyano, SCN, OCN, C₁-C₁₂alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₄alkoxy, C₁-C₁₂alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₆alkoxy-C₁-C₆alkylthio, C₁-C₆alkoxy-C₁-C₆alkylsulfinyl, C₁-C₆alkoxy-C₁-C₆alkylsulfonyl, C₂-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂alkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₂-C₁₂haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylthio, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfonyl, (C₁-C₄alkoxy)₂P(O)O, C₁-C₄alkyl-(C₁-C₄alkoxy)P(O)O, H(C₁-C₄alkoxy)P(O)O,

R₄₄R₄₅N, R₇₅R₇₆NNH-, R₄₆R₄₇NC(O)O-, R₇₇R₇₈NC(O)NH-, C₁-C₄alkyl-S(O)₂NR₄₈, C₁-C₄haloalkyl-S(O)₂NR₄₉, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C₁-C₆alkoxy, C₁-C₆alkylthio or cyano, C₂-C₁₈alkenylcarbonyloxy, C₂-C₁₈alkynylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂alkoxycarbonyloxy, C₁-C₁₂alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbonyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be

- 131 -

substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano,

or a group Ar₆-thio, Ar₇-sulfinyl, Ar₈-sulfonyl, -OCO-Ar₉ or NH-Ar₁₀ in which Ar₆, Ar₇, Ar₈, Ar₉ and Ar₁₀ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₅₀, NR₅₁R₅₂, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₅₀ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

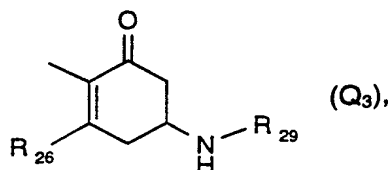
R₅₁ is hydrogen or C₁-C₆alkyl;

R₅₂ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₄₆, R₄₄, R₄₈, R₄₉, R₇₅ and R₇₇ independently of one another are hydrogen or C₁-C₄alkyl;

R₄₇, R₄₅, R₇₆ and R₇₈ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₄₄ and R₄₅ together or R₄₆ and R₄₇ together or R₇₅ and R₇₆ together or R₇₇ and R₇₈ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups; or are the group Q₃

- 132 -



in which

R₂₆ is hydroxyl, O⁻M⁺, halogen, cyano, SCN, OCN, C₁-C₁₂ alkoxy, C₁-C₄alkoxycarbonyl-C₁-C₄ alkoxy, C₁-C₁₂alkylthio, C₁-C₁₂alkylsulfinyl, C₁-C₁₂alkylsulfonyl, C₁-C₁₂haloalkylthio, C₁-C₁₂ haloalkylsulfinyl, C₁-C₁₂haloalkylsulfonyl, C₁-C₆alkoxy-C₁-C₆alkylthio, C₁-C₆alkoxy-C₁-C₆ alkylsulfinyl, C₁-C₆alkoxy-C₁-C₆alkylsulfonyl, C₂-C₁₂alkenylthio, C₂-C₁₂alkenylsulfinyl, C₂-C₁₂ alkenylsulfonyl, C₂-C₁₂alkynylthio, C₂-C₁₂alkynylsulfinyl, C₂-C₁₂alkynylsulfonyl, C₂-C₁₂ haloalkenylthio, C₂-C₁₂haloalkenylsulfinyl, C₂-C₁₂haloalkenylsulfonyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylthio, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfinyl, C₁-C₄alkoxycarbonyl-C₁-C₄alkylsulfonyl, (C₁-C₄alkoxy)₂P(O)O, C₁-C₄alkyl-(C₁-C₄alkoxy)P(O)O, H(C₁-C₄alkoxy)P(O)O,

R₅₃R₅₄N, R₇₉R₈₀NNH-, R₅₅R₅₆NC(O)O-, R₈₁R₈₂NC(O)NH-, C₁-C₄alkyl-S(O)₂NR₅₇, C₁-C₄ haloalkyl-S(O)₂NR₅₈, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O, C₁-C₁₈alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C₁-C₆alkoxy, C₁-C₆alkylthio or cyano, C₂-C₁₈alkenylcarbonyloxy, C₂-C₁₈alkynylcarbonyloxy, C₃-C₆cycloalkylcarbonyloxy, C₁-C₁₂ alkoxycarbonyloxy, C₁-C₁₂alkylthiocarbonyloxy, C₁-C₁₂alkylthiocarbamoyl, C₁-C₆alkyl-NH(CS)N(C₁-C₆alkyl)-NH-, di-C₁-C₆alkyl-N(CS)N(C₁-C₆alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄ haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄ alkyl), halogen, nitro or cyano,

or a group Ar₁₁-thio, Ar₁₂-sulfinyl, Ar₁₃-sulfonyl, -OCO-Ar₁₄ or NH-Ar₁₅ in which Ar₁₁, Ar₁₂, Ar₁₃, Ar₁₄ and Ar₁₅ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in

which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₅₉, NR₆₀R₆₁, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₅₉ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₆₀ is hydrogen or C₁-C₆alkyl;

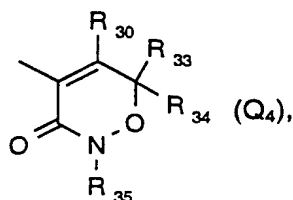
R₆₁ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₅₅, R₅₃, R₅₇, R₅₈, R₇₉ and R₈₁ independently of one another are hydrogen or C₁-C₄alkyl; R₅₆, R₅₄, R₈₀ and R₈₂ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₅₃ and R₅₄ together or R₅₅ and R₅₆ together or R₇₉ and R₈₀ together or R₈₁ and R₈₂ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups;

R₂₉ is hydrogen, C₁-C₆alkyl, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, (C₁-C₄alkyl)NHCO, phenylaminocarbonyl, benzylaminocarbonyl or (C₁-C₄alkyl)₂NCO, where the phenyl and benzyl groups for their part may each be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro or cyano;

or is the group Q₄

- 134 -



in which

R_{30} is hydroxyl, O^+M^+ , halogen, cyano, SCN, OCN, C_1 - C_{12} alkoxy, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkoxy, C_1 - C_{12} alkylthio, C_1 - C_{12} alkylsulfinyl, C_1 - C_{12} alkylsulfonyl, C_1 - C_{12} haloalkylthio, C_1 - C_{12} haloalkylsulfinyl, C_1 - C_{12} haloalkylsulfonyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylthio, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfinyl, C_1 - C_6 alkoxy- C_1 - C_6 alkylsulfonyl, C_2 - C_{12} alkenylthio, C_2 - C_{12} alkenylsulfinyl, C_2 - C_{12} alkenylsulfonyl, C_2 - C_{12} alkynylthio, C_2 - C_{12} alkynylsulfinyl, C_2 - C_{12} alkynylsulfonyl, C_2 - C_{12} haloalkenylthio, C_2 - C_{12} haloalkenylsulfinyl, C_2 - C_{12} haloalkenylsulfonyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylthio, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfinyl, C_1 - C_4 alkoxycarbonyl- C_1 - C_4 alkylsulfonyl, $(C_1$ - C_4 alkoxy) $_2$ P(O)O, C_1 - C_4 alkyl-(C_1 - C_4 alkoxy)P(O)O, H(C_1 - C_4 alkoxy)P(O)O,

$R_{62}R_{63}N$, $R_{83}R_{84}NNH-$, $R_{64}R_{65}NC(O)O-$, $R_{85}R_{86}NC(O)NH-$, C_1 - C_4 alkyl-S(O) $_2$ NR $_{66}$, C_1 - C_4 haloalkyl-S(O) $_2$ NR $_{67}$, C_1 - C_4 alkyl-S(O) $_2$ O, C_1 - C_4 haloalkyl-S(O) $_2$ O, C_1 - C_{18} alkylcarbonyloxy, where the alkyl group may be substituted by halogen, C_1 - C_6 alkoxy, C_1 - C_6 alkylthio or cyano, C_2 - C_{18} alkenylcarbonyloxy, C_2 - C_{18} alkynylcarbonyloxy, C_3 - C_6 cycloalkylcarbonyloxy, C_1 - C_{12} alkoxycarbonyloxy, C_1 - C_{12} alkylthiocarbonyloxy, C_1 - C_{12} alkylthiocarbonyl, C_1 - C_6 alkyl-NH(CS)N(C_1 - C_6 alkyl)-NH-, di- C_1 - C_6 alkyl-N(CS)N(C_1 - C_6 alkyl)-NH-, benzyloxy, benzylthio, benzylsulfinyl, benzylsulfonyl, phenoxy, phenylthio, phenylsulfinyl, phenylsulfonyl, phenylsulfonyloxy or benzoyloxy, where the phenyl groups for their part may each be substituted by C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, C_1 - C_4 alkoxy, C_1 - C_4 haloalkoxy, C_1 - C_4 alkylcarbonyl, C_1 - C_4 alkoxycarbonyl, C_1 - C_4 alkylamino, di- C_1 - C_4 alkylamino, C_1 - C_4 alkylthio, C_1 - C_4 alkylsulfinyl, C_1 - C_4 alkylsulfonyl, C_1 - C_4 alkyl-S(O) $_2$ O, C_1 - C_4 haloalkylthio, C_1 - C_4 haloalkylsulfinyl, C_1 - C_4 haloalkylsulfonyl, C_1 - C_4 haloalkyl-S(O) $_2$ O, C_1 - C_4 alkyl-S(O) $_2$ NH, C_1 - C_4 alkyl-S(O) $_2$ N(C_1 - C_4 alkyl), halogen, nitro or cyano,

or a group Ar $_{16}$ -thio, Ar $_{17}$ -sulfinyl, Ar $_{18}$ -sulfonyl, -OCO-Ar $_{19}$ or NH-Ar $_{20}$ in which Ar $_{16}$, Ar $_{17}$, Ar $_{18}$, Ar $_{19}$ and Ar $_{20}$ independently of one another are a five- to ten-membered monocyclic or fused bicyclic ring system which may be aromatic or partially saturated and may contain 1 to 4 heteroatoms selected from the group consisting of nitrogen, oxygen and sulfur, and in

which each ring system may not contain more than 2 oxygen atoms and not more than two sulfur atoms, and in which the ring system for its part may be mono-, di- or trisubstituted by C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, mercapto, C₁-C₆alkylthio, C₁-C₆haloalkylthio, C₃-C₆alkenylthio, C₃-C₆haloalkenylthio, C₃-C₆alkynylthio, C₂-C₅alkoxyalkylthio, C₃-C₅acetylalkylthio, C₃-C₆alkoxycarbonylalkylthio, C₂-C₄cyanoalkylthio, C₁-C₆alkylsulfinyl, C₁-C₆haloalkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₆haloalkylsulfonyl, aminosulfonyl, C₁-C₂alkylaminosulfonyl, C₂-C₄dialkylaminosulfonyl, C₁-C₃alkylene-R₆₈, NR₆₉R₇₀, halogen, cyano, nitro, phenyl and benzylthio, where phenyl and benzylthio for their part may be substituted on the phenyl ring by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro, and where substituents on the nitrogen in the heterocyclic ring are different from halogen;

R₆₈ is C₁-C₃alkoxy, C₂-C₄alkoxycarbonyl, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or phenyl, where phenyl for its part may be substituted by C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₁-C₃haloalkoxy, halogen, cyano or nitro;

R₇₀ is hydrogen or C₁-C₆alkyl;

R₆₁ is C₁-C₆alkyl or C₁-C₆alkoxy;

R₆₄, R₆₂, R₆₆, R₆₇, R₈₃ and R₈₅ independently of one another are hydrogen or C₁-C₄alkyl;

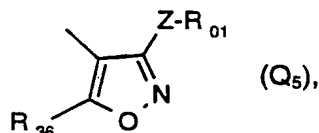
R₆₅, R₆₃, R₈₄ and R₈₆ independently of one another are hydrogen, C₁-C₁₂alkyl, hydroxyl, C₁-C₁₂alkoxy, C₃-C₆alkenyloxy or C₃-C₆alkynyloxy; or R₆₂ and R₆₃ together or R₆₄ and R₆₅ together or R₈₃ and R₈₄ together or R₈₅ and R₈₆ together are pyrrolidino, piperidino, morpholino, thiomorpholino, which may be mono- or polysubstituted by methyl groups;

R₃₃ and R₃₄ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₄alkoxycarbonyl, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-NHS(O)₂, C₁-C₄haloalkyl, -NH-C₁-C₄alkyl, -N(C₁-C₄alkyl)₂, C₁-C₆alkoxy or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₆alkylthio, C₁-C₆alkylsulfinyl, C₁-C₆alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano; or R₃₃ and R₃₄ together form a C₂-C₆alkylene bridge; and

R₃₅ is hydrogen, C₁-C₆alkyl, C₃-C₆alkenyl, C₃-C₆alkynyl or benzyl, which for its part may be substituted by halogen, methyl or methoxy, or is C₁-C₄alkoxycarbonyl or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₄haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄

- 136 -

alkylcarbonyl, C₁-C₄alkoxycarbonyl, amino, C₁-C₄alkylamino, di-C₁-C₄alkylamino, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄haloalkyl-S(O)₂O, C₁-C₄alkyl-S(O)₂NH, C₁-C₄alkyl-S(O)₂N(C₁-C₄alkyl), halogen, nitro, COOH or cyano;
or is the group Q₅



in which

Z is S, SO or SO₂;

R₀₁ is hydrogen, C₁-C₈alkyl, C₁-C₈alkyl substituted by halogen, C₁-C₄alkoxy, C₁-C₄alkylthio, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, -CO₂R₀₂, -COR₀₃, -COSR₀₄, -NR₀₅R₀₆, CONR₀₃₆R₀₃₇ or phenyl, which for its part may be substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₂₅R₂₆, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₁₅CO₂R₀₂₇;
or R₀₁ is C₂-C₈alkenyl or C₂-C₈alkenyl substituted by halogen, C₁-C₄alkoxy, C₁-C₄alkylthio, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, -CONR₀₃₂R₀₃₃, cyano, nitro, -CHO, -CO₂R₀₃₈, -COR₀₃₉, -COS-C₁-C₄alkyl, -NR₀₃₄R₀₃₅ or phenyl which for its part may be substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-

C_1-C_4 alkyl, $CONR_{040}R_{041}$, $OSO_2-C_1-C_4$ haloalkyl, OSO_2 -phenyl, C_1-C_4 alkylthio, C_1-C_4 haloalkylthio, phenylthio, C_1-C_4 alkylsulfonyl, C_1-C_4 haloalkylsulfonyl, phenylsulfonyl, C_1-C_4 alkylsulfinyl, C_1-C_4 haloalkylsulfinyl, phenylsulfinyl, C_1-C_4 alkylene-phenyl or $-NR_{043}CO_2R_{042}$; or R_{01} is C_3-C_6 alkynyl or C_3-C_6 alkynyl substituted by halogen, C_1-C_4 haloalkyl, cyano, $-CO_2R_{044}$ or phenyl, which for its part may be substituted by C_1-C_4 alkyl, C_1-C_6 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_2-C_6 alkenyl, C_3-C_6 alkynyl, C_3-C_6 alkenyloxy, C_3-C_6 alkynyloxy, halogen, nitro, cyano, $-COOH$, $COOC_1-C_4$ alkyl, COO phenyl, C_1-C_4 alkoxy, phenoxy, $(C_1-C_4$ alkoxy)- C_1-C_4 alkyl, $(C_1-C_4$ alkylthio)- C_1-C_4 alkyl, $(C_1-C_4$ alkylsulfinyl)- C_1-C_4 alkyl, $(C_1-C_4$ alkylsulfonyl)- C_1-C_4 alkyl, $NHSO_2-C_1-C_4$ alkyl, $NHSO_2$ -phenyl, $N(C_1-C_6$ alkyl) $SO_2-C_1-C_4$ alkyl, $N(C_1-C_6$ alkyl) SO_2 -phenyl, $N(C_2-C_6$ alkenyl) $SO_2-C_1-C_4$ alkyl, $N(C_2-C_6$ alkenyl) SO_2 -phenyl, $N(C_3-C_6$ alkynyl) $SO_2-C_1-C_4$ alkyl, $N(C_3-C_6$ alkynyl) SO_2 -phenyl, $N(C_3-C_7$ cycloalkyl) $SO_2-C_1-C_4$ alkyl, $N(C_3-C_7$ cycloalkyl) SO_2 -phenyl, $N(phenyl)SO_2-C_1-C_4$ alkyl, $N(phenyl)SO_2$ -phenyl, $OSO_2-C_1-C_4$ alkyl, $CONR_{028}R_{029}$, $OSO_2-C_1-C_4$ haloalkyl, OSO_2 -phenyl, C_1-C_4 alkylthio, C_1-C_4 haloalkylthio, phenylthio, C_1-C_4 alkylsulfonyl, C_1-C_4 haloalkylsulfonyl, phenylsulfonyl, C_1-C_4 alkylsulfinyl, C_1-C_4 haloalkylsulfinyl, phenylsulfinyl, C_1-C_4 alkylene-phenyl or $-NR_{031}CO_2R_{030}$; or R_{01} is C_3-C_7 cycloalkyl, C_3-C_7 cycloalkyl substituted by C_1-C_4 alkyl, C_1-C_4 alkoxy, C_1-C_4 alkylthio, C_1-C_4 alkylsulfinyl, C_1-C_4 alkylsulfonyl or phenyl, which for its part may be substituted by halogen, nitro, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_1-C_4 alkylthio, C_1-C_4 haloalkylthio, C_1-C_4 alkyl and C_1-C_4 haloalkyl; or

R_{01} is C_1-C_4 alkylene- C_3-C_7 cycloalkyl, phenyl, or phenyl which is substituted by C_1-C_4 alkyl, C_1-C_6 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_2-C_6 alkenyl, C_3-C_6 alkynyl, C_3-C_6 alkenyloxy, C_3-C_6 alkynyloxy, halogen, nitro, cyano, $-COOH$, $COOC_1-C_4$ alkyl, COO phenyl, C_1-C_4 alkoxy, phenoxy, $(C_1-C_4$ alkoxy)- C_1-C_4 alkyl, $(C_1-C_4$ alkylthio)- C_1-C_4 alkyl, $(C_1-C_4$ alkylsulfinyl)- C_1-C_4 alkyl, $(C_1-C_4$ alkylsulfonyl)- C_1-C_4 alkyl, $NHSO_2-C_1-C_4$ alkyl, $NHSO_2$ -phenyl, $N(C_1-C_6$ alkyl) $SO_2-C_1-C_4$ alkyl, $N(C_1-C_6$ alkyl) SO_2 -phenyl, $N(C_2-C_6$ alkenyl) $SO_2-C_1-C_4$ alkyl, $N(C_2-C_6$ alkenyl) SO_2 -phenyl, $N(C_3-C_6$ alkynyl) $SO_2-C_1-C_4$ alkyl, $N(C_3-C_6$ alkynyl) SO_2 -phenyl, $N(C_3-C_7$ cycloalkyl) $SO_2-C_1-C_4$ alkyl, $N(C_3-C_7$ cycloalkyl) SO_2 -phenyl, $N(phenyl)SO_2-C_1-C_4$ alkyl, $N(phenyl)SO_2$ -phenyl, $OSO_2-C_1-C_4$ alkyl, $CONR_{045}R_{046}$, $OSO_2-C_1-C_4$ haloalkyl, OSO_2 -phenyl, C_1-C_4 alkylthio, C_1-C_4 haloalkylthio, phenylthio, C_1-C_4 alkylsulfonyl, C_1-C_4 haloalkylsulfonyl, phenylsulfonyl, C_1-C_4 alkylsulfinyl, C_1-C_4 haloalkylsulfinyl, phenylsulfinyl, or $-NR_{048}CO_2R_{047}$; or

R_{01} is C_1-C_4 alkylene-phenyl, COR_{07} or 4-6-membered heterocyclyl;

R_{02} , R_{038} , R_{044} and R_{066} independently of one another are hydrogen, C_1-C_4 alkyl, phenyl, or phenyl which is substituted by C_1-C_4 alkyl, C_1-C_6 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_2-C_6 alkenyl, C_3-C_6 alkynyl, C_3-C_6 alkenyloxy, C_3-C_6 alkynyloxy, halogen, nitro, cyano, $-COOH$,

COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₄₉R₀₅₀, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₅₂CO₂R₀₅₃;

R₀₃, R₀₃₉ and R₀₆₇ independently of one another are C₁-C₄alkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₇₀R₀₅₄, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₅₆CO₂R₀₅₅;

R₀₄ is C₁-C₄alkyl;

R₀₅ is hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂H, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂H, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₅₇R₀₅₈, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl,

phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₆₀CO₂R₀₅₉;

R₀₆ is hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl or phenyl which is substituted by C₁-C₄alkyl, C₁-C₆haloalkyl, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₆alkenyloxy, C₃-C₆alkynyloxy, halogen, nitro, cyano, -COOH, COOC₁-C₄alkyl, COOphenyl, C₁-C₄alkoxy, phenoxy, (C₁-C₄alkoxy)-C₁-C₄alkyl, (C₁-C₄alkylthio)-C₁-C₄alkyl, (C₁-C₄alkylsulfinyl)-C₁-C₄alkyl, (C₁-C₄alkylsulfonyl)-C₁-C₄alkyl, NHSO₂-C₁-C₄alkyl, NHSO₂-phenyl, N(C₁-C₆alkyl)SO₂-C₁-C₄alkyl, N(C₁-C₆alkyl)SO₂-phenyl, N(C₂-C₆alkenyl)SO₂-C₁-C₄alkyl, N(C₂-C₆alkenyl)SO₂-phenyl, N(C₃-C₆alkynyl)SO₂-C₁-C₄alkyl, N(C₃-C₆alkynyl)SO₂-phenyl, N(C₃-C₇cycloalkyl)SO₂-C₁-C₄alkyl, N(C₃-C₇cycloalkyl)SO₂-phenyl, N(phenyl)SO₂-C₁-C₄alkyl, N(phenyl)SO₂-phenyl, OSO₂-C₁-C₄alkyl, CONR₀₆₁R₀₆₂, OSO₂-C₁-C₄haloalkyl, OSO₂-phenyl, C₁-C₄alkylthio, C₁-C₄haloalkylthio, phenylthio, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylsulfonyl, phenylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkylsulfinyl, phenylsulfinyl, C₁-C₄alkylene-phenyl or -NR₀₆₄CO₂R₀₆₃;

R₀₇ is phenyl, substituted phenyl, C₁-C₄alkyl, C₁-C₄alkoxy or -NR₀₈R₀₉;

R₀₈ and R₀₉ independently of one another are C₁-C₄alkyl, phenyl or phenyl which is substituted by halogen, nitro, cyano, C₁-C₄alkyl, C₁-C₄alkoxy, C₁-C₄thioalkyl, -CO₂R₀₆₆, -COR₀₆₇, C₁-C₄alkylsulfonyl, C₁-C₄alkylsulfinyl, C₁-C₄haloalkyl; or R₀₈ and R₀₉ together form a 5-6-membered ring which may be interrupted by oxygen, NR₀₆₅ or S,

R₀₁₅, R₀₃₁, R₀₄₃, R₀₄₈, R₀₅₂, R₀₅₆, R₀₆₀ and R₀₆₄ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl or C₃-C₇cycloalkyl;

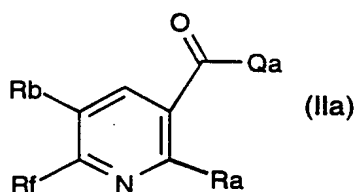
R₀₂₅, R₀₂₆, R₀₂₇, R₀₂₈, R₀₂₉, R₀₃₀, R₀₃₂, R₀₃₃, R₀₃₄, R₀₃₅, R₀₃₆, R₀₃₇, R₀₄₀, R₀₄₁, R₀₄₂, R₀₄₅, R₀₄₆, R₀₄₇, R₀₄₉, R₀₅₀, R₀₅₃, R₀₅₄, R₀₅₅, R₀₅₇, R₀₅₈, R₀₅₉, R₀₆₁, R₀₆₂, R₀₆₃, R₀₆₅ and R₀₇₀ independently of one another are hydrogen, C₁-C₄alkyl, C₂-C₆alkenyl, C₃-C₆alkynyl, C₃-C₇cycloalkyl, phenyl, or phenyl which is substituted by halogen, nitro, cyano, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkylthio, C₁-C₄haloalkylthio, C₁-C₄alkyl or C₁-C₄haloalkyl; and

R₃₆ is C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₃-C₆cycloalkyl or C₃-C₆cycloalkyl which is substituted by halogen, C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆haloalkenyl, C₃-C₆alkynyl, C₃-C₆haloalkynyl, C₁-C₄alkoxycarbonyl, C₁-C₄alkylthio, C₁-C₄alkylsulfinyl, C₁-C₄alkylsulfonyl, C₁-C₄haloalkylthio, C₁-C₄haloalkylsulfinyl, C₁-C₄haloalkylsulfonyl, C₁-C₄alkylcarbonyl, di-C₁-C₄alkylamino, C₁-C₄alkoxy, C₁-C₄haloalkoxy, C₁-C₄alkyl-S(O)₂O, C₁-C₄haloalkyl-S(O)₂O or phenyl which for its part may be substituted by halogen, C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₆alkenyl, C₃-C₆alkynyl,

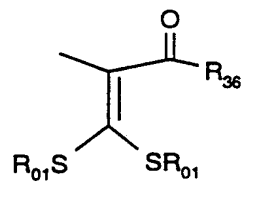
- 140 -

cyano, nitro or COOH; and agronomically acceptable salts M^+ and all stereoisomers and tautomers of the compounds of the formula I.

2. A compound of the formula IIa



in which Q_a is hydroxyl, halogen, cyano or a group $-CH_2(CO)R_{36}$ or

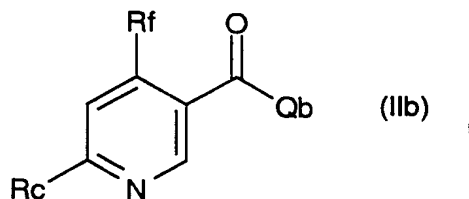


R_b is hydrogen, C_1 - C_4 alkyl or halogen;

R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl, heptafluoro-n-propyl or trichloromethyl;

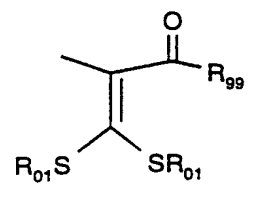
R_a is C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_3 - C_4 cycloalkyl, C_1 - C_2 alkoxy- C_1 - C_4 alkyl, C_1 - C_2 alkylthiomethyl, hydroxyl, halogen, cyano, C_1 - C_3 alkoxy, C_1 - C_3 haloalkoxy, allyloxy, propargyloxy, C_1 - C_3 alkylthio, C_1 - C_3 alkylsulfinyl, C_1 - C_3 alkylsulfonyl or C_1 - C_3 alkylsulfonyloxy, and R_{01} and R_{36} are defined as under group Q_5 of the formula I, except for the compounds 2,6-bis-trifluoromethylnicotinic acid, 2,6-bis-trifluoromethyl-5-methoxynicotinic acid and 2-hydroxy-6-trifluoromethylnicotinic acid.

3. A compound of the formula IIb



- 141 -

in which Q_B is hydroxyl, halogen, cyano, or a group -CH₂(CO)R₉₉ or



R₉₉ is C₁-C₄alkyl, C₁-C₄haloalkyl, C₃-C₄cycloalkyl or C₁-C₄alkoxy;

R_f is trifluoromethyl, difluorochloromethyl, pentafluoroethyl or heptafluoro-n-propyl; and

R_C is C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₂alkoxymethyl, C₁-C₂alkylthiomethyl, hydroxyl, halogen, cyano, C₁-C₃alkoxy, C₁-C₃haloalkoxy, allyloxy, propargyloxy, C₁-C₃alkylthio, C₁-C₃alkylsulfinyl, C₁-C₃alkylsulfonyl or C₁-C₃alkylsulfonyloxy and R₀₁ is as defined under formula I.

4. A herbicidal and plant-growth-inhibiting composition, which contains a herbicidally effective amount of a compound of the formula I on an inert carrier.

5. A method for controlling undesirable plant growth, wherein a herbicidally effective amount of an active compound of the formula I or a composition which contains this active compound is applied to the plants or their habitat.

6. A method for inhibiting plant growth, wherein a herbicidally effective amount of an active compound of the formula I or a composition which contains this active compound is applied to the plants or their habitat.

7. The use of a composition according to claim 4 for controlling undesirable plant growth.

INTERNATIONAL SEARCH REPORT

Inte: onal Application No

PCT/EP 99/06761

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C07D213/61 C07D213/50 C07D213/26 C07D213/89 C07D405/12
C07D401/12 C07D417/12 C07D401/04 C07D413/06 C07D413/14
C07D417/14 C07D413/04 A01N43/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07D A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 46530 A (DU PONT ; TSENG CHI PING (US); PATEL KANU MAGANBHAI (US); RORER MOR) 11 December 1997 (1997-12-11) cited in the application claims 1,16,17; examples	1,4-7
A	WO 97 34485 A (CIBA GEIGY AG ; RUEEGG WILLY (CH)) 25 September 1997 (1997-09-25) cited in the application examples	1,4-7
A	GB 2 305 174 A (ZENECA LTD) 2 April 1997 (1997-04-02) example 11	2
A	US 4 747 871 A (MONSANTO COMPANY) 31 May 1988 (1988-05-31) claim 1	2

☐ Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 December 1999

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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